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SURGERY AND THE BASIC SCIENCES

THE APPLICATION OF RECENT CONTRIBUTIONS IN BASIC MEDICAL SCIENCES TO SURGICAL PRACTICE

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SOME ASPECTS OF THE LIVER

NUTRITIONAL FACTORS WHICH AFFECT THE LIVER

DURING the past few years a number of dietary factors have been shown to affect the composition of the liver, particularly its fat content. It has been shown experimentally (5) that a low-protein, low-choline, and high-fat diet results in the production of livers with a high-fat content. Choline-free proteins have been evaluated with regard to their relative efficacy in preventing these fatty changes, and in the order of decreasing lipotropic activity these are: gromax or whale protein, casein, albumin, beef-muscle protein, edestin, fibrin and gliadin, and gelatin and zein (11). It has been reported (36) and verified (10) that the lipotropic property of the various proteins is related to their cystine and methionine contents. The former amino-acid intensifies the fatty-liver-producing properties of the diet while the latter one tends to inhibit the accumulation of fat in the liver, having, in this respect, a similar action to choline (6). It is not apparent as to whether or not these two amino-acids account for the entire action of protein in preventing the accumulation of fat in the liver.

In addition to the lipotropic action of choline, which was pointed out several years ago, it has been shown (22) that a choline deficiency in growing rats results in hemorrhagic degeneration of the kidneys as well as in marked fatty changes in the liver. Cortical hemorrhages occur from ten to twelve days after the animals are placed on the diet; uremia and death are terminal manifestations of this deficiency. Sufficient amounts of casein or methionine in the diet reduce the choline requirements, while cystine tends to accentuate the lesions which result from choline deficiency (23). A cholesterol-rich diet has been shown (26) to be capable of producing fatty livers in animals when included in the diet in relatively large amounts. Choline is capable of preventing these fatty changes in the liver (8) although incapable of preventing the atherosclerotic changes which occur in the aorta of rabbits fed a cholesterol-rich diet (4, 35). Choline cannot prevent the infiltration but it hastens (7) the removal of the fat which accumulates in the liver during phosphorus or carbon-tetrachloride poisoning. It is not apparent from the literature whether or not the administration of choline will prevent the severe secondary anemia which has been shown to accompany the fatty liver and enlarged spleen produced by feeding a cholesterol-rich diet to guinea pigs (29). With radio-active phosphorus as an indicator, it has been shown (30) that choline facilitates the removal of fat from the liver by increasing the turnover of phospholipid in this organ, whereas cholesterol decreases this process. It has also been shown (27) that there is impairment of the bromsulfalein excretion from the blood of rats with fatty livers and that the

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administration of choline improves the excretion as well as reduces the fasting ketosis which occurs in these animals.

There is evidence to indicate that other nutritional factors are involved in the production and prevention of fatty livers in experimental animals. The effect of pancreatectomy on the fat content of the liver has long been recognized, and a thorough review and discussion of the literature pertaining to lipocaic and to fatty infiltration of the liver in pancreatic diabetes has recently appeared (12). It has also been shown that ligation of the external ducts of the pancreas results in fatty infiltration of the liver and causes changes in the blood lipids (14, 32). These changes can be prevented by the feeding of raw pancreas (25), and choline (15) will also prevent the fatty infiltration of the liver that accompanies experimental pancreatic atrophy. Water-soluble meat extractives have been shown (31) to be of consequence in the production of fatty infiltration of the liver following ligation of the pancreatic ducts, since a diet minus these extractives failed to produce the fatty changes while their addition caused the fatty changes such as occur when whole meat is fed. Vitamin B_6 deficiency has also been shown to cause fatty livers in the rat (24).

The effect of various dietary factors in increasing the resistance of the liver to injury has been studied by several groups of investigators. The importance of an adequate carbohydrate intake in the treatment of diseases of the liver has recently been reviewed (34). This review points out the necessity for the intravenous administration of glucose in instances in which an adequate hyperglycemia cannot be obtained by the oral administration of carbohydrate. The use of insulin in conjunction with a high carbohydrate diet is discouraged in the non-diabetic patient on the basis that the administration of insulin increases the peripheral uptake of sugar and thus stimulates the hepatic output of glucose. The object of maintaining a hyperglycemia is to suppress the hepatic output of sugar and permit the storage of glycogen. The blood-sugar level is indicated as the criterion of the adequacy of the carbohydrate intake and it is emphasized that this intake must be generous to be effective. The effect of diet upon the resistance of the liver to injury by chloroform has been studied in the rat (20). The authors correlated the susceptibility of the liver to injury by chloroform with the fat and glycogen content of this organ. They believe that the protein content of the diet is of greatest importance in the prevention of liver injury by chloroform. The protective action of a protein-rich diet, consumed for some time prior to exposure to the chloroform, is ascribed to the lower fat content of the liver resulting from such a diet and to the protein reserve which accumulates. Carbohydrates are considered of importance in that they serve as protein sparers, but no particular protection is ascribed *per se* to the presence of glycogen in the liver. Results of a study (9) of the resistance of the liver to injury by carbon tetrachloride showed that the greatest resistance to this intoxicant occurred on a high-carbohydrate diet. Greatest susceptibility was observed on a fat-rich diet, while regeneration was most marked on a high-protein diet. The protective action of an extract of the liver against acute poisoning with carbon tetrachloride was reported in 1936 (17, 18). Since that time further studies have shown that the active principle of this liver extract is xanthine (28). The effect of this liver extract and of xanthine in protecting against this central necrosis has been confirmed (3), but the mechanism of action is not known, although any effect on the rate of liver regeneration appears to have been excluded (16). That the action of xanthine is not a specific one is indicated by the fact that india ink, tertiary calcium phosphate, and sodium ricenoleate also furnish protection (19). It has been suggested that some reaction at the site of injection may cause the protection observed. All of these substances lower the serum esterase elevation which results from chloroform or carbon-tetrachloride intoxication. Selenium has been shown (1) to produce toxic symptoms and cirrhosis of the liver in a number of different experimental animals. A high protein diet (21, 33) affords some protection against this poison. Also, arsenic, either as arsenite or arsenate, has been reported (13) as capable of protecting against poisoning by selenium. The mechanism of this protection is still obscure.

SERUM PHOSPHATASE AND DISEASES OF THE LIVER

Since the first experimental and clinical demonstrations (3, 15) of the increase in serum phosphatase which follows obstruction of the common bile duct, a number of publications (4, 5, 8, 9, 10, 12, 14, 16, 17, 19) have appeared on the alterations in activity of this enzyme which occur in liver disease. There has been considerable difference of opinion as to the value of the serum-phosphatase determination as a diagnostic aid in determining the origin of jaundice. The majority of investigators have agreed that the greatest elevations of serum phosphatase occur most frequently in extrahepatic obstructive lesions.

Elevation of the serum phosphatase also occurs in hepatocellular jaundice, and while the elevation is less marked there is sufficient overlapping of the serum values to cause some authors to conclude that this test has no diagnostic significance in distinguishing a hepatitis from an obstruction of the common bile duct. Practically all authors agree that there is very little or no elevation of the serum phosphatase in hemolytic jaundice which is uncomplicated by liver obstruction or hepatitis.

The simultaneous determination of serum phosphatase and bilirubin in patients with jaundice has been proposed (16) as an additional aid in the interpretation of the serum phosphatase. These workers found that in an obstructive jaundice the serum phosphatase and bilirubin tend to parallel one another until the limit of phosphatase values is obtained, while in a non-obstructive jaundice (hepatitis) the continued rise in bilirubin is not paralleled by the increase in serum phosphatase, since the latter, in their experience, rarely rose above 10 units.

The serum phosphatase may also be elevated in liver injury which is unaccompanied by jaundice. Poisoning by certain solvents, such as carbon tetrachloride, has been shown experimentally (7) to cause a serum-phosphatase elevation of several times normal unaccompanied by any elevation of the icteric index of the serum or of bile-pigment excretion in the urine of experimental animals. In experimental obstruction of the common bile duct (1) an elevation of the serum phosphatase precedes by a number of hours any significant elevation in the serum bilirubin, and after the common bile duct obstruction has been relieved the serum-phosphatase elevation only slowly recedes to normal and persists at a high level long after the icteric index is normal. It has also been demonstrated (6) that the transfusion of blood from a dog with obstruction of the common bile duct leads to a much more prolonged elevation in the recipient of the serum phosphatase than of the bilirubin. These observations all tend to indicate that the serum-phosphatase elevation may be a much more sensitive indication of liver involvement than the serum bilirubin. Perhaps one of the greatest fields of usefulness of the test is in detection of disturbances of the liver with insufficient impairment of function to be demonstrable by other means. Diseases of the bones would necessarily have to be excluded. It has been shown that the hepatitis caused by arsenical therapy (11) may be accompanied by an elevation of the serum phosphatase and it is possible that the incipient hepatitis caused by this and other chemical agents, such as certain volatile solvents, might be demonstrable, particularly if one followed the serum activity of this enzyme from the beginning of exposure to the potential injury. This test might be useful in the control of arsenical therapy.

It has been assumed by some investigators (13, 18) that the serum phosphatase originates solely in the bones and that its presence in bile is the result of excretion from the serum as is the case with bilirubin. There is both experimental and clinical evidence which suggests that such may not be true of the serum-phosphatase elevation which occurs in liver disease. In acute yellow atrophy of the liver or congenital atresia of the bile duct the serum phosphatase may be relatively low while the serum bilirubin is relatively high (10). If the enzyme is extrahepatic in origin there should be a serum rise similar to that of bilirubin. Experimental evidence is also available which supports the view that the enzyme may, at least in part, originate in the liver. Obstruction of the hepatic bile ducts of approximately one-third of the liver results in a definite elevation of the serum phosphatase without any jaundice in the dog (7). Extirpation of a similar amount of liver leads to only a slight and transient elevation of the serum phosphatase. In each instance the excretory capacity of the liver has been similarly reduced for at least a short period of time. The injection of acacia into the circulation of the dog has been shown (2) to increase the serum phosphatase and to lower the total cholesterol and the cholesterol esters of the serum. These findings were interpreted as evidence of the non-osseous origin of serum phosphatase.

The assumption that the serum-phosphatase elevation associated with liver disease originates in the liver results in a useful approach to the interpretation of the serum findings in any given instance. The phosphatase increase in the serum in liver disease becomes the result of the ability of the liver to produce the enzyme and its accessibility to the circulation. In diseases which destroy the parenchyma of the liver, such as cirrhosis, the enzyme elevation in the serum would be less as the cirrhosis progressed and the parenchyma was replaced by fibrous tissue. In acute yellow atrophy of the liver in which the function of the liver is greatly reduced, the slight increase of serum phosphatase and marked jaundice would indicate that the liver has lost both its ability to excrete the pigment and to form the enzyme.

LIVER FUNCTION TESTS

1. Jaundice—Pigment changes in the urine and feces. Recent studies (33, 37, 38) have added

much to our knowledge of the urinary and fecal excretion of urobilinogen in health and disease. The daily normal output of urobilinogen according to one method (37, 38) is 0.4 mgm. in the urine and from 40 to 280 mgm. in the feces. According to another method (33), the normal figures are from 150 to 300 mgm. per 100 gm. of stool and from 1 to 8 mgm. per cent in the urine. The normal values for fecal elimination are about twice as high by the latter method and the author of this method believes that some loss occurs in the other procedure.

Studies of urobilinogen elimination are of value in detecting and following the progress of hepatic damage (33) as well as in the differential diagnosis of intrahepatic and obstructive jaundice (33, 38, 41, 42). Such studies also help to differentiate between malignant biliary obstruction and obstruction due to other causes (33, 38, 41). Jaundice due to stone and to diffuse hepatic disease is not accompanied by complete obstruction or cessation of the bile flow (as evidenced by less than 5 mgm. of urobilinogen daily in the feces and none or only a trace in the urine); on the other hand, this is a constant finding in obstructive jaundice due to neoplasm (33, 38, 41). The determination of urobilinogen in the urine is emphasized as valuable in the diagnosis of complete external biliary obstruction (42). Diffuse hepatic disease is usually characterized by a marked increase in urinary urobilinogen; jaundice due to stone is not accompanied by any considerable increase in urinary urobilinogen unless such complications as acute cholecystitis, cholangitis, or biliary cirrhosis are present (38). Fecal urobilinogen is markedly increased in hemolytic jaundice (33, 38) and serves as an index of red blood-cell destruction (33).

The analytical methods of Watson are too difficult for general clinical use (33, 35). Several practical disadvantages have been pointed out (35): (1) the urine and stools require hours of preparation by a skilled chemist; (2) urinary urobilinogen is directly influenced by fever, inanition, and physical activity; and (3) the stool estimation is often unreliable since it is frequently impossible to get 4 daily consecutive normal stools in patients who have nausea and vomiting and often require liquid diets. Sparkman (33) claims simplicity, rapidity, and clinical adaptability for his modified method and believes that valuable clinical information can be obtained from single urine and stool specimens. It is believed (15) that such studies will prove to be valuable tests of liver function as well as an aid in differential diagnosis.

2. *Hippuric-acid test.* The hippuric-acid test is thought to be of greatest value in prognosis (31, 32, 42, 45) and in the estimation of surgical risk (31, 32, 42). It is a reliable index of the degree of liver damage present (3, 4, 6, 14, 26, 31, 32, 42, 43, 44). The test has been found to be more reliable than the cholesterol-ester percentage in the prognosis of acute liver disease and far more reliable in chronic cirrhosis and gall-bladder disease (42). It has been found (6) to be a valuable aid in the detection of liver damage in cases of jaundice and in some cases of cholecystitis and cholelithiasis. The results of the hippuric-acid test in jaundiced patients correspond in general to the degree of hepatic injury seen at operation or autopsy (31). A reduction in hippuric-acid elimination to 50 per cent or less means severe parenchymatous liver damage and a greatly increased surgical risk (32). Some (3, 4) believe that this test possesses most of the advantages and lacks most of the disadvantages of other liver-function tests. It has been found (3, 4) to be of value in determining liver damage in hyperthyroidism. A comparative study of the plasma prothrombin level, hippuric-acid test, galactose tolerance, bromsulfalein excretion, and plasma fibrinogen levels (44) has shown the prothrombin level and hippuric-acid excretion to reflect most sensitively and consistently the amount of liver damage present. The patients did not have jaundice or biliary fistulas.

The value of the hippuric-acid test in the differential diagnosis of jaundice is supported by some (26, 45) and denied by others (32, 42, 43). It is probably of value in differentiating intrahepatic jaundice from obstructive jaundice of short duration. However, in long-standing obstruction, its value is limited.

Extrahepatic factors to be considered in the interpretation of the hippuric-acid test have received considerable attention (14, 25, 31, 42, 43, 45). The importance of normal kidney function has been emphasized by several authors (14, 31, 42, 43, 45). Some (45) believe that the test is of no practical value and is contraindicated in advanced renal disease. The simultaneous determination of urea clearance enhances the value of the test (14). It has been reported (25) that the usefulness of the test is not affected by impaired renal function unless this is so severe as to be accompanied by urea retention. Other factors which limit the value of the test are cardiac decompensation (45), dehydration (31, 42, 43), malnutrition, and gastric retention (31).

Various modifications of the test have been suggested. A new technique for the determina-

tion of hippuric acid in the urine has been described (39). Abbreviation of the test to a two-hour period is reported (25) as satisfactory for most clinical purposes. Intravenous modifications of the test have also been described (19, 27, 28). This technique insures accurate dosage, avoids difficulties with vomiting, and requires less time and a smaller volume of specimen, as well as a smaller dose of benzoate (19).

PRECIPITATION AND FLOCCULATION TESTS

1. *Takata-Ara test.* Considerable attention has recently been directed toward this test. Most workers agree that it is not specific for cirrhosis of the liver (5, 7, 11, 12, 13, 22). The test is positive in slightly over 50 per cent of cases with moderately severe hepatic damage and hence is not specific for any single disease of the liver (5, 12, 22). It is positive in most malignant involvements of the liver and may be positive in cases in which the liver is enlarged as a result of cardiac failure (5). It is occasionally positive in patients without liver damage (5, 13, 22). The test is correlated to a great extent with changes in the albumin-globulin ratio (22) and is likely to be positive in any disease in which the globulin level is elevated (13).

The test may be negative in early cirrhosis, becoming positive later in the disease (7, 26, 31) It is of more value in prognosis and in the estimation of surgical risk than in diagnosis (22), as it becomes less positive and even negative as the patient improves (7, 22). Horejsi (11) found the test positive in 83 per cent of his cases of cirrhosis and believes that this is valuable confirmatory evidence in the diagnosis of cirrhosis. In general, a positive test confirms the diagnosis of cirrhosis whereas a negative test would lead one to question the diagnosis (23).

The T-A test is a much less sensitive indicator of hepatic injury than the dye test (22, 31), becoming positive only when liver damage is considerable (7, 22). Others state (2) that the test is not significant enough to be of value in the clinic as an additional laboratory procedure.

2. *The Weltman serum-coagulation reaction.* This test, introduced by Weltman (40) in 1930, has been used extensively in Europe but has received little attention in this country. Only five references have been found in the American literature. The test is by no means specific for diseases of the liver It is not diagnostic of any disease but is a non-specific reaction which aids in distinguishing exudative from fibrotic processes (17, 18). It appears to be of diagnostic and prognostic value especially in tuberculosis and rheumatic fever. A number of workers (6, 16) have applied the test primarily to diseases of the liver. These authors believe it to be of value in the differential diagnosis of obstructive and parenchymatous jaundice. The fact that the test was usually normal in obstructive jaundice whereas a shift to the right in the C. B. (coagulation band) accompanied parenchymatous liver damage was also noted by other workers (17). It has been reported (6) that this test appears to be the most delicate method of detecting early liver damage.

3. *Blood-serum colloidal-gold curve.* Studies on the colloidal gold curve of the blood serum in cases of liver disease have recently been reported (8). The technique of the test, except for certain details of dilution and pH adjustment, is essentially the same as the familiar Lange spinal-fluid test. A positive test (as indicated by a paretic type of curve) was found in 89 of 96 patients with various types of liver disease. In 34 of these cases, the diagnosis was proved by autopsy, biopsy, or laparotomy. The test was negative in 20 normal adults and in 73 of 75 patients with various extrahepatic diseases. A positive test may be related to an increase in the euglobulin fraction of the blood proteins.

DYE EXCRETION TESTS

Retention of bromsulfalein is constantly associated with histological evidence of liver damage as proved by autopsy or at operation, and in the absence of jaundice, this test is probably the most practical now available (1, 32); information obtained from it is as reliable as can be gained in any other way (31). It is of value in prognosis and in estimating surgical risk (1, 20, 31). However, there is evidence (24) which indicates that the removal of bromsulfalein from the blood stream is a function of the entire reticulo-endothelial system of which the liver is only a part.

It has been found (29) that the azorubin-S-excretion test is as reliable as the bromsulfalein test and better than the hippuric-acid test in cirrhosis, while in relatively early cases of chronic hepatitis, it excels both of these tests.

TESTS OF CARBOHYDRATE METABOLISM

Galactose tolerance. Some (30) believe that this test done properly early in jaundice still remains the most reliable single laboratory test for the differential diagnosis of obstructive and toxic jaundice. The value of the test in this connection is supported by others (6, 36, 41). It has been pointed out (36) that its differential value is lost in cases of chronic jaundice as well as in early obstructive jaundice accompanied by inflamma-

tion of the biliary passages. Others (31) believe that the test is unreliable for the differentiation between intrahepatic and obstructive jaundice. These workers found the test consistently negative in portal and biliary cirrhosis, and in their experience, the test had no value whatever in patients who were not visibly jaundiced. The blood galactose level following oral administration has been determined (21). A normal tolerance was found in obstructive jaundice and an abnormal result was obtained in toxic jaundice and hyperthyroidism. The author believes the test to be of value in the demonstration of parenchymatous liver damage.

Levulose tolerance. This test has recently been modified to the extent of estimation of the blood levulose level instead of the total blood sugar as originally described (9, 10, 34). Thus errors due to variations in blood glucose levels are avoided. Diabetes is believed by some (31) to interfere with the test. This is denied by others (10, 34). Apparently, the test is not very sensitive, and in chronic liver disease, clinical signs and symptoms usually precede the development of a positive test (10). It is reported (6) that the test is not delicate enough to be used as a routine procedure. In general, its field of usefulness is limited (31).

MECHANICAL CAUSES OF LIVER DAMAGE

1. *Chronic passive congestion.* A number of recent articles have dealt with the effects of cardiac failure on the liver. The literature has been reviewed up to 1938 (1, 8) and the reviewers give the results of their own studies on 75 cases of cardiac disease in which prolonged single or multiple episodes of congestive heart failure occurred. These authors describe three types of changes occurring in the liver:

1. The usual histopathological picture was that of a central lobular atrophy or necrosis or both. This occurred in 49 per cent of their cases.

2. The next most common finding was central lobular atrophy or necrosis together with a condensation and thickening of the hepatic reticulum but without true cirrhosis (44 per cent). Finally, actual hepatic cirrhosis occurred in 7 per cent. In these cases there was marked degeneration with complete destruction of entire lobules in scattered regions. Reversed lobulations were a prominent feature. Patchy areas of fibrosis and regions of adenomatous regeneration of hepatic tissue were seen. There was an increase in the number of lymphocytes and bile ducts. The authors conclude that true cirrhosis developing in the course of congestive heart failure does occur but it is rare, and suggest that cirrhosis occurs in cases having repeated episodes rather than in those with prolonged failure.

On the basis of a study of 2,000 autopsies (including 286 cases with chronic passive congestion), it has been reported (6) that cardiac cirrhosis, signifying a morphological increase in liver connective tissue consequent to congestive failure, occurs in the majority of patients who have suffered from even mild congestive failure for nine months or more. Although central fibrosis seemed to be peculiar to these cases, periportal fibrosis also occurs. However, clinical cardiac cirrhosis with extreme fibrosis and evidence of portal obstruction is rare. Other workers state (2) that a persistent rise in venous pressure was found to be associated with a highly characteristic fibrosis of the liver based on altered hemodynamics. Probably chronic anoxia is also an etiological factor.

2. *Biliary obstruction.* Mechanical obstruction of the biliary passages may be caused by stones, intrinsic or extrinsic tumors, enlarged lymph nodes, parasites, pancreatitis, inflammatory or postoperative strictures and adhesions, or congenital anomalies.

Recently 244 cases in which necropsy showed biliary obstruction and obstructive jaundice have been studied (3). The obstructive lesion was neoplastic in 64.3 per cent and benign in 35.7 per cent. Using parenchymatous atrophy, fibrosis, and nodular parenchymal regeneration as their diagnostic criteria, these authors found true hepatic cirrhosis in 8.6 per cent, or 21 cases. In 16 of these, the obstruction was benign (10 postcholecystectomy stricture; 6 cholelithiasis); in 5 malignant. Since benign obstructions constituted only 35 per cent of the total number of cases and yet made up 75 per cent of the cases with cirrhosis, the higher incidence of cirrhosis in benign obstruction is very apparent. This fact has been noted by others (3, 4, 5, 7). In this connection, it is of significance to note that the average duration of life after the first appearance of jaundice was three and eight-tenths years for the benign obstructions and only one-half year for the neoplastic obstructions.

The microscopic changes associated with obstructive cirrhosis consisted of widespread parenchymal degenerative changes which were usually most marked around the central vein; a moderate to marked increase in portal connective tissue; areas of parenchymal regeneration; bile thrombi; an increase in the interlobular bile ducts; and collections of lymphocytes and polymorphs. These workers (3) suggest that the infrequent combination of biliary obstruction, obstructive jaundice, and true hepatic cirrhosis be

called "cirrhosis from biliary obstruction," and that cases showing hepatic parenchymal damage without signs of regeneration should be classified as hepatic atrophy. Hepatic infarction has also been noted (9) in periarteritis nodosa and myelogenous leucemia.

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THE RELIEF OF DEAFNESS IN OTOSCLEROSIS BY FISTULIZATION OF THE LABYRINTH

Collective Review

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THE surgical relief of otosclerotic deafness has been an intriguing problem among otologists for many years, especially since no other form of treatment has had any beneficial effect. This deafness is due to the fixation of the foot plate of the stapes in the oval window by new bone formation. The surgical solution has generally been assumed to be the establishment and maintenance in some other part of the labyrinth of a substitute window, covered by a thin flexible membrane, to take over the function normally exercised by the oval window. That this assumption is correct is shown by the immediate improvement in hearing following the various procedures directed toward this end. The subsequent loss of this improvement has been due to the rapid closure of the artificial fistula in the labyrinth by bone regeneration.

Kessel, in 1876, attempted to remove the foot plate of the stapes and have it replaced by a cicatricial membrane This procedure was a failure because of the difficulty of removing the foot plate and the danger of infection entering the labyrinth from the middle-ear cavity.

In 1897, Passow elevated the periosteum over the promontory, trephined a window into the labyrinth, and covered the opening with the previously elevated periosteum. Unfortunately, the marked improvement following this procedure lasted only a few days, and the danger of labyrinthine infection could not be excluded.

Because of the danger to life, and the fleeting nature of the improvement in hearing, these methods were generally and vigorously opposed by the leading otologists of that time.

About 1910, Barany suggested making a fistula in the posterior vertical semicircular canal, to avoid the danger of infection of the labyrinth. When he performed this operation, the immediate improvement in hearing was marked, but lasted only two weeks.

In 1914, Jenkins (5) opened the horizontal canal in 2 patients, covering the fistula in one case with a Thiersch skin graft and in the other with a flap from the external auditory canal. There was marked improvement in the hearing immediately, but shortly afterward one patient's hearing fell below the pre-operative level and the other patient became totally deaf.

In 1917, Gunnar Holmgren (3) resected the bone between the summit of the anterior vertical canal and the dura, utilizing the latter for the covering membrane. In 1 case operated on by this method, the improvement in hearing was good but lasted only a short time.

When Robert Barany was in this country, in 1922, he described a two-stage operation which he had devised and performed (1):

1. A preliminary mastoidectomy was performed with an attempt to wall off the tympanum by filling the mastoid cavity with transplants of fat.

2. Some weeks later the mastoid was reopened and a fistula made in the horizontal canal. A strip of fat was then inserted into the fistula in an endeavor to keep it open. Here, again, the immediate results were good but the improvement lasted only two weeks.

While much has been written on this subject in recent years, a clear understanding of the evolution and present status of this problem can probably best be reached by a review of the work of Gunnar Holmgren of Stockholm, Maurice Sourdille of Nantes, and Julius Lempert of New York.

HOLMGREN

In 1920, Holmgren (4) operated by making a fistula in the promontory and covering it with the mucoperiosteum of the promontory itself. The results were fairly good but did not last long. He reported these cases at the Otorhinolaryngological Congress at Paris.

In 1922 he performed a similar operation on the horizontal canal, covering the fistula with the mucoperiosteum of the canal itself.

Over a period of fifteen years he operated by variations of this method on 35 patients whose hearing was too bad to enable them to follow their usual vocations.

The immediate improvement in hearing was remarkable, but lasted only a few weeks. In some

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of these cases, however, a slight improvement persisted over a fairly long period and the patients were enabled to resume their work.

SOURDILLE

After seeing Holmgren's work in 1924, Maurice Sourdille (9) of Nantes, France, enthusiastically attacked the problem and devised an operation which he called "tympano-labyrinthopexy." Briefly, this operation is designed to create a thin, epithelized membrane of scar tissue to provide a covering for the fistula in the horizontal semicircular canal, and to incorporate this fistula in the reconstructed tympanic cavity. It is performed in three or more stages:

1. The skin and periosteum of the posterosuperior walls of the auditory canal are removed and the denuded bony area is allowed to heal with a thin epithelial membrane, which is later utilized to cover the fistula in the canal.

2. Four or five months later a radical mastoid operation is performed, the head of the malleus is resected, and the membranous flap is placed so as to seal off the tympanic cavity and cover the site of the horizontal canal.

3. After this has healed, in four or five months, that part of the flap over the horizontal canal is elevated and a fistula is made, which fistula is immediately re-covered with the flap.

4 and 5. If the hearing diminishes postoperatively, indicating a closure of the fistula, the third stage of the operation is repeated at intervals in an endeavor to obtain a permanent opening.

Sourdille states that as soon as the canal is opened, "the increase in hearing seems considerable, ten, twenty times and even more than the preoperative hearing distance. . . . The hearing which ordinarily decreased in the days following the operation increases as soon as cicatrization has taken place, and attains or even surpasses the hearing observed on the operating-table, the moment the labyrinth is opened." He states that manometer readings show that an air pressure from 2 to 10 c.m. of water will produce a definite horizontal nystagmus and definite vertigo. He continues as follows:

"In a great number of cases, unfortunately, the success is ephemeral: four, six, or ten weeks later one sees the aerial hearing diminish, and at the same time the air pressure in the meatus can attain 40 and even 60 c.m. of water without determining nystagmus, nor a sensation of vertigo.

"This is due to the fact that the labyrinthine fistula closes, due to the reconstitution of a rigid, bony layer, which rarely attains the thickness of the primitive bony canal, and more often does not exceed a few tenths of a millimeter. It suffices, in a complementary operation, to extract this bony film, to see the hearing gain of the first operation return, sometimes be even greatly increased. This time the result will be lasting, the regenerating process of the bone becoming gradually exhausted. In many cases, however, I had to open the labyrinth three times."

In 1935, Sourdille reported at the Congress of Paris as follows:

Number of patients operated on	109
Number of operations performed	325
Positive results	74 per cent
Very good results, ten times and more than previous hearing distance	40 per cent
Good distance, from five to ten times previous hearing distance	14 per cent
Mediocre results, from two to five times previous hearing distance	20 per cent
Fatalities	None
On October 6, 1937 the number of patients exceeded	140
Number of operations	400

He stated that he was now able to obtain positive results in 80 per cent, of which 60 per cent were superior by ten times to the pre-operative hearing distance.

He says, "I have had in mind, primarily, the creation of a surgical technique giving very important practical hearing results, and creating an impression on the patient and his immediate relations, but I hope that in the future a precise audiometric measurement will permit us further to improve the method and especially its indications and contraindications."

It is difficult to evaluate Sourdille's work because, as far as I can learn, few otologists have witnessed his operations or had the opportunity of examining his patients. Holmgren (4), in the course of a careful analysis of the 109 cases Sourdille reported in 1935, calls attention to the fact that 29 cases were listed as non-terminated and 12 cases as not followed up. Of the remaining 68 cases, 41 were said by Sourdille to have shown improvement. Holmgren calls attention to the fact that there were 2 cases with stenotic eustachian tubes and not less than 20 cases of tubal occlusion, and that no information is given as to roentgen examination. Audiometric tests are generally lacking.

Besides the usual sources of error in testing hearing with the whispered and spoken voice, Holmgren mentions the following:

1. Different examining rooms give very different results.

2. No examiner is able to control exactly the degree of voice used for different examinations.

3. Patients who are repeatedly examined become trained and a guessing factor also has to be considered.

4. Patients with very poor hearing lose the habit of listening. (This attention factor may later be stimulated.)

5. Hearing in otosclerotic patients is often variable.

Analyzing the 41 cases which showed improvement, he selects about 12 in which he believes the errors of voice testing could account for the improvement, and concludes:

"In a moderate number of cases the definitive results appear to me to be so far above hearing before operation that one must assume that at operation a sound fistula must have been established which remained functioning over a period of years."

HOLMGREN

In 1935, encouraged by Sourdille's optimistic reports, Holmgren again attacked, along different lines, this problem of establishing a permanent fistula. Believing that the closure of the fistulas by bone was due to the fact that he had covered them with bone-forming tissue, i.e. periosteum or dura, he endeavored to obtain a non-bone-forming lining of the mastoid cavity to be utilized as a cover for the fistula. He tried Thiersch skin grafts (one of which was successful), fat (as Barany had done), and various prostheses—rubber, Stent's mass, and paraffine. In one series of cases he placed gold leaf over the fistula to prevent the fat's adhering to the membranous canal. In some cases the endolymphatic sac was exposed.

At the Otorhinolaryngological Congress in Berlin, in 1936, he presented 6 cases which had been operated on by this method from one to twelve months previously. Before operation the patients heard conversational voice at from 0.3 to 0.6 meters. At the presentation one heard conversational voice at 4 meters and the others at 10 meters. However, the improvement disappeared in nearly all of the cases after a lapse of from eighteen months to two years. In the cases which were reoperated on, the fistulas were found closed with bone. After this bone was removed, the hearing was again temporarily improved.

Noting the fact that fistulas caused by cholesteatoma tend to remain open and that these fistulas are covered by a thin pavement epithelium, and noting also his successful result with the Thiersch skin graft, and Sourdille's favorable reports in the cases in which the fistula covering was of thin connective tissue covered with pavement epithelium, he thought that this type of covering might be responsible for the fistulas' remaining open. In order to test this possibility, he operated on a series of cases by performing a "conservative radical" operation, sealing off the tympanum from the mastoid cavity. After the mastoid cavity had become lined with a thin, pavement epithelial membrane, it was reopened, the epithelial membrane elevated over the horizontal canal, the fistula made, and the epithelial membrane replaced over the fistula. While the immediate results were good, sufficient time has not elapsed to report on the permanence of the results.

Holmgren believes, as a result of his many years of work on this problem, that in spite of some successes by various methods, "the requirements for maintaining permeability of a bony fistula have, therefore, not been discovered, and will consequently have to be the subject of further study."

As a result of this belief, he performed a series of experimental operations on monkeys, whose labyrinthine capsule is rather like that of the human being. He tried to produce fistulas by prolonged pressure erosion, and to prevent new bone formation by grinding bone dust into the haversian canals, by means of the electrolytic action of various metals, by irradiation with radium, and by covering the fistulas with peritoneum, thin fascia from the temporal muscle, and Thiersch skin grafts. In other cases a thin, platinum wire was introduced into the canal and allowed to remain, to render possible a permanent decompression of the perilabyrinthine pressure.

After various periods of time, from twenty-three to three hundred and sixty-five days, the animals were killed and the temporal bones sent to Professor F. R. Nager (8) for histological examination, who reported that in all the specimens the fistulas were closed by bony tissue which had developed from the periosteal layer of the labyrinthine capsule. The enchondral layer showed no reaction, while the endosteal layer showed some connective-tissue formation.

He did note, however, that in those cases in which squamous-celled epithelial tissue was implanted in the fistula bone production seemed to be less. In the cases in which radium had been used, bone regeneration was greatly reduced.

LEMPERT

In this country Julius Lempert (6, 7), who has been working on this problem since 1926, has devised a one-stage operation which consists of:

"1. Creation of a trough-like fenestra in the bony capsule of the external semicircular canal

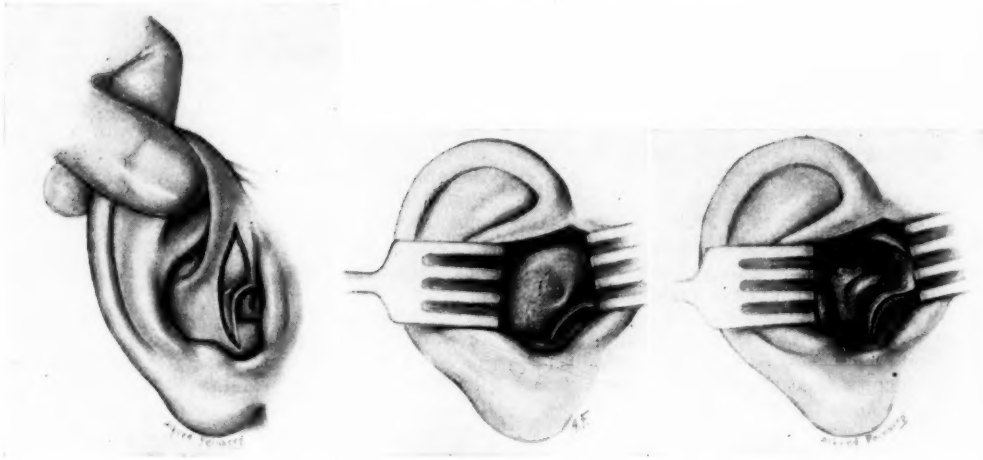

Fig. 1. Fig. 2. Fig. 3.

Fig. 1. The endaural incisions have been made and the triangular membranous flap has been removed.

Fig. 2. The illustration shows the antauricular exposure of the mastoid process.

Fig. 3. Note the exposure and sharp definition of the external semicircular canal.

with the aid of a dental polishing and burnishing burr. This fistula is created in order to replace the non-functioning fenestra ovalis and thus to mobilize the labyrinthine perilymph and endolymph for air-borne sounds.

"2. Incorporation of this newly created fenestra within the confines of a newly reconstructed, air-filled and hermetically sealed tympanic cavity.

"3. Reconstruction of the osseous external canal to permit access of sound waves directly to the newly created fenestra in the external semicircular canal."

This operation he performs under combined analgesia and local anesthesia, through his "endaural antauricular approach to the temporal bone," i.e., through the external auditory meatus instead of the usual postaural mastoid incision.

He first removes a triangular flap from the outer third of the posterior and superior walls of the auditory canals. This window is then mobilized by elevating the periosteum over the outer surface of the mastoid and the posterior root of the zygoma. The antrum is opened with an electrically driven burr, all surrounding cells are removed, and the horizontal canal is sharply outlined.

From this stage on, the technical difficulties of the operation greatly increase. The tympanomeatal cutaneous membrane, which is later to be utilized in reconstructing the tympanic cavity and covering the fenestra in the horizontal canal, consists of the thin lining of the bony external canal (except the antero-inferior portion) and the tympanic membrane including Shrapnell's membrane. Obtaining this flap intact, without separation of the meatal portion from the tympanic portion at the site of the annulus tympanicus and without perforation of the tympanic membrane, is a task of the greatest difficulty and delicacy. It is best accomplished first by skeletonizing the bone, and then by removing the thin, bony cortex from the membrane in tiny fragments, rather than by attempting to elevate the membrane from the bone. This is done in the following order:

The posterior canal wall is skeletonized to a point level with the vertical portion of the facial canal. The posterosuperior canal wall, with any remaining cells, is next skeletonized. This exposes the posterior portion of the incus. This skeletonization is then extended anteriorly until the entire attic is exposed, and the anterosuperior canal wall is skeletonized anteriorly beyond the notch of Rivinus.

The skeletonized bone is then removed, a millimeter at a time, up to the sulcus tympanicus. This structure is then skeletonized, posterior and anterior to the notch of Rivinus, until it fractures spontaneously. The minute fragments are removed from the fibrocartilaginous ring of the tympanic membrane. The bone above Shrapnell's membrane is now skeletonized and removed. In order to permit this membrane to be swung posteriorly to cover the labyrinthine fenestra, it

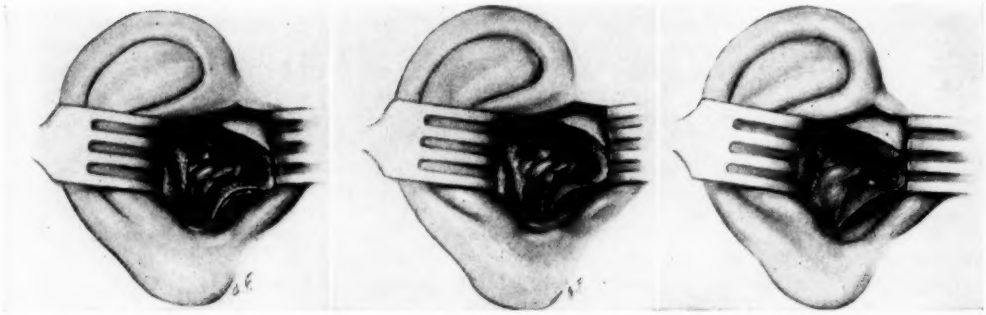

Fig. 4. Fig. 5. Fig. 6.

Fig. 4. Note the exposure of the incudomalleolar joint and the anterior malleolar ligament.

Fig. 5. The tympanomeatal cutaneous membrane has been created. The long crus of the incus and the chorda tympani nerve are exposed to view.

Fig. 6. The head and neck of the malleus are amputated. The incudostapedial joint, the chorda tympani nerve, and the tendon of the tensor tympani muscle are exposed to view.

must be freed from its attachment to the ossicular chain. This is accomplished by separating the malleus from the incus and then resecting the head and neck of the malleus with a specially designed instrument. It must be done without disturbing the incus.

Fenestration of the horizontal canal requires the utmost delicacy and patience and must be completed without injury to the membranous labyrinth. Under brilliant illumination and powerful magnifying glasses, the bone is slowly worn down with a dental polishing burr, the operator waiting whenever necessary for any bleeding to cease spontaneously. The excavation is begun on the outer and posterior (upper) surface of the external semicircular canal and is extended backward and downward; this trough is slowly deepened until the lumen of the canal can be seen through the transparent floor of the trough as a bluish gray line. The walls of the trough are then widened to the width of the canal down to the endosteum. Then the bony walls of the fenestra are burnished with a 24-carat gold burnishing burr. Before completion of the fenestra by opening of the perilymphatic space, the tympanomeatal membrane is freed from its remaining attachments to the anterosuperior and postero-inferior canal walls, and a final revision of the bony cavity is made, in order that the completed fistula can be covered immediately with this membrane. The endosteum is then carefully pulverized with a polishing burr along the posterior (superior) and concave surfaces of the canal rather than on the convex surface. This decreases the danger of injury to the membranous labyrinth which would defeat the object of the operation.

The size of the fenestra is an opening into the perilymphatic space measuring from 3 to 7 mm. by 1.5 mm.

All particles of bone dust are carefully removed to decrease the possibility of osteogenesis.

The tympanomeatal membrane, which is attached only to the remaining anterior and inferior portions of the sulcus tympanicus, is now swung backward and upward so that the fenestra is covered by Shrapnell's membrane and the adjacent part of the membrana tensa. The remainder of this membrane seals off the attic space, and the meatal portion lines part of the mastoid cavity. This is molded and held in position by the pressure of paraffin mesh filling the bony cavity.

A routine mastoid dressing is then applied. The first complete dressing, with gentle removal of the paraffin mesh, is done on the eighth day, great care being exercised not to disturb the flap. The wound is then dressed every other day until epidermization of the cavity is complete. This operation in reality extends the tympanic cavity backward so as to include the fenestra within that space.

Lempert reports (7) that he has performed this operation in 120 cases in the last two years with the restoration of practical physiological hearing in 69 cases. Ten cases showed audiometric improvement but not sufficient for practical hearing. Further impairment occurred in 14 cases. The hearing remained unimproved in 27 cases. The tinnitus disappeared in the 79 cases in which hearing was improved, remained unchanged in the 27 cases without improvement, and increased in the 14 cases in which further impairment of hearing occurred.

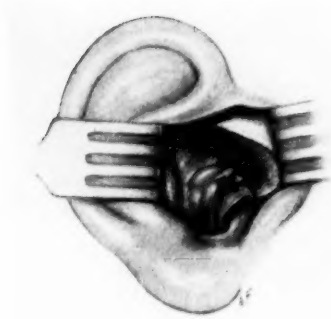

Fig. 7.

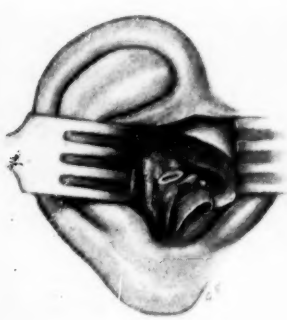

Fig. 8.

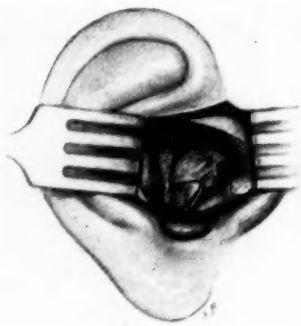

Fig. 9.

Fig. 7. The illustration shows the incision for final liberation of the meatal portion of the tympanomeatal membrane.

Fig. 8. The illustration shows the fenestra created in the external semicircular canal.

Fig. 9. The illustration shows the tymparomeatal membrane covering the reconstructed tympanic cavity and the fenestra in the external semicircular canal.

(Courtesy of Dr. Lempert and of the Archives of Otolaryngology.)

The fenestra remained open in 100 cases, although the hearing was improved in only 79.

Lempert made 38 revisions of the fenestra in 31 cases in which hearing diminished and the fistula test became negative.

He gives detailed operative findings and audiometric studies of these cases (7).

Osteogenesis is the predominating cause of closure of the fenestra, although sometimes the closure may be due to fibrosis. Osteogenesis may sometimes only partially close the fenestra.

Revision should not be attempted until from four to six months have elapsed after closure of the fenestra. Revision of the fenestra involves a much greater risk of injury to the membranous labyrinth than the original operation because the endosteal bony lid was always found attached to the membranous labyrinth.

(In deference to Wittmaak's theory that otosclerosis is due to a perilabyrinthine venous stasis, Lempert has, in some cases, elevated the dura over the epitympanic space to relieve this stasis.)

OSTEOGENESIS

That the establishment of an artificial opening in the labyrinth as a substitute for the non-functioning oval window results in an immediate and marked improvement in hearing in cases of otosclerotic deafness is a generally accepted fact. That this improvement is all too often lost by closure of the fistula or fenestra by osteogenesis is evident in a careful study of reported cases. While this osteogenetic closure has been lessened in frequency by improvements in operative technique, Holmgren and some others believe that the ultimate solution of this problem will be found in the experimental laboratory rather than on the operating table. The report of Nager, however, on Holmgren's experiments on monkeys indicates that only a start has been made in this direction.

Sourdille's statement that repeated fistulization will exhaust the regenerative power of bone is certainly open to question.

Canfield (2) reports that in experiments on the cat's skull, defects made with sharp instruments and re-covered with the periosteum showed bone regeneration taking place in two weeks, but in defects made with the dental polishing burr (as used by Lempert) regeneration had not occurred after the same period of time. He concluded that the essential factor in maintaining a permanent fistula lies in the manner of making the fistula rather than in the tissue placed over the defect.

Lempert (7), however, points out that because of the short period of time (two weeks) covered by these experiments, the only deduction that can be drawn is that the use of the dental polishing burr retards the power of bone regeneration.

Lempert, as a result of his study of the cases he has operated on, believes that, in addition to the retarding effect on bone regeneration of the polishing burr and the impregnation of the cut surface of the bone with gold, the character of the tissue used to cover the defect is also an important factor. In his revision of cases he found that in none of the cases in which bone regeneration occurred had he succeeded in covering the fenestra with Shrapnell's membrane (an epithelized surface in contact with the labyrinthine opening), but that the periosteal-lined flap of the meatal

portion was found strongly adherent to the fenestra. In none of the cases in which Shrapnell's membrane had been successfully applied to the fenestra did he find it adherent to bony walls of that opening. (Whether these two factors actually inhibit osteogenesis or only further postpone that process, will require longer observation before a positive conclusion can be reached.)

Because of his observations and because the fistula he now makes (up to 7 mm. in length) cannot be covered entirely with Shrapnell's membrane, he now places a Thiersch skin graft on the periosteal surface of the meatal portion of the flap so that an epithelized surface covers the entire fenestra. Sufficient time has not yet elapsed to permit of any definite conclusions as to the efficacy of this procedure.

At first, reports of this procedure were received quite critically by otologists in general, chiefly because of vague indications in the selection of cases for the operation, the failure to utilize the audiometer in testing the hearing (pre-operatively and postoperatively), and the short period of time which had elapsed since operation in some of the cases reported. However, these criticisms carry less weight at the present time because of the greater care exercised in the preliminary study of prospective cases and the careful audiometric studies submitted. For example: Holmgren, who reported in his first series of 35 patients, "They had such diminished hearing that they were unable to pursue their vocations," now uses the whisper test and the spoken-voice test with the untested ear, "masked" by a Barany noise apparatus. (These tests are made both in a silent chamber and in an ordinary examination room by more than one examiner.) He also tests with tuning forks, both by air and bone conduction. He states, "The variations in the results of examination are striking and significant."

He now believes, "The best method of obtaining objective and commensurable values is to make use of an audiometer. Hearing results following operations for otosclerosis, recorded only by whispering and conversational distance, are not reliable, provided the differences and distances are not very great."

"An audiometric examination before and after operation might demonstrate whether any real improvement whatsoever had occurred."

He stresses the necessity of absence of catarrh and middle-ear infections.

Sourdille's requirements are:

Otosclerotic deafness with hearing between 50 cm. of whispered voice and 50 cm. of shouted voice with the opposite ear masked.

Large and straight auditory canal. Normal drumhead with absence of any evidence of middle-ear inflammation, past or present. Stereoscopic radiograms.

Patients should be between the ages of eighteen and fifty-five and in good general health.

Lempert's (7) indications for fenestration now are as follows:

1. When the loss of hearing is bilateral and progressive.

2. When the stapes is fixed within the fenestra ovalis but the membrane of the round window has remained normal.

3. When the hearing by air conduction in the conversational frequencies, 512, 1024, 2048, has declined to a level which makes practical hearing of conversation impossible, while the hearing by bone conduction at these frequencies, as determined audiometrically with the opposite ear masked, has remained normal or has declined to a level not lower than 30 decibels. (Bone conduction is the index of cochlear nerve function.)

4. When the tympanic membrane is normal and completely intact.

5. When there is complete absence of infection in the middle ear.

6. When the lining of the bony walls of the external auditory canal is intact and healthy.

7. When the eustachian tube is patent.

8. When the patient is in a normal state of health.

The following hearing tests are made several times, at different intervals, before operation:

1. Audiometric testing (with a 6-A Western Electric Audiometer) of air and bone conduction with masking of the opposite ear.

2. Tuning-fork tests for both air and bone conduction.

3. Testing by means of normal conversation and whisper.

Further advances may be looked for along three lines:

1. *The selection of cases.* Otosclerosis is a disease about which little is still known as to its etiology and progress, and in which often the diagnosis cannot be made positively. The development of vacuum-tube hearing aids has greatly increased the field for these devices and probably will have a tendency to limit the selection of cases for fistulization to the patients who are still unable to obtain serviceable hearing by artificial aids, or who for some psychological or occupational reason may find the surgical method preferable. As more knowledge along these lines becomes available, the selection of proper cases will become more accurate, and the exclusion of

unsuitable cases more certain. The information obtained by the further study of cases already operated on, as more time elapses, will also undoubtedly give added help along these lines.

2. *The study of osteogenesis.* Because nearly all the failures reported have been due to closure of the fistula by new bone formation, study of this problem in the laboratory is of the greatest importance. If some method to prevent bone regeneration in the fistula, which can be used clinically, can be discovered, the field of this procedure will be greatly extended, and probably the operative technique can be made less complicated.

3. *The simplification of operative technique.* While undoubtedly, as time goes on, the technique will be simplified, at present the operation is exceedingly delicate and difficult. The detachment, intact, of the flap, consisting of the membranous auditory canal and the drumhead, and the amputation of the head of the malleus without injury to the drumhead or disturbance of the incus is a task requiring the greatest skill and delicacy. After the mastoid antrum has been opened and the horizontal canal exposed, the creation of a window in that dense, bony structure and the opening of the perilymphatic space without injury to the membranous canal, which must be done under a magnifying lens, is a task which taxes to the utmost the talents of the most skilful aural surgeon, even though he has had the most painstaking instruction, and practice on the cadaver. (Lempert's operation may require from three to seven hours for its completion.)

Lempert stresses the fact that because these two procedures are fundamental factors, they cannot be developed into an operation for use by otologists in general, but will necessarily be limited to those few who are willing to devote the time and labor necessary to develop the delicate skill and finesse necessary for their successful performance.

It is a tribute to the skill of these men to note the fact that none of them has had a death from any intracranial complication, in the many cases in which they have performed fistulization of the labyrinth.

While many still feel that the operation is in the investigative stage, the gradual improvement in the results reported by these men and their associates justifies the feeling that there is being evolved along these lines an operative procedure which will restore practical hearing to many patients affected with otosclerotic deafness, for whom no treatment heretofore has been in any degree effective.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Naylor-Strong, C.: Some Considerations of the Pathology and Treatment of Suppurations Around the Angle of the Mandible. *Proc. Roy. Soc. Med.*, Lond., 1940, 33: 693.

The author divides acute inflammations in the region of the angle of the mandible into three groups:

1. Those caused by infection about partially erupted teeth
2. Postoperative infections
3. Infection following injection of local anesthesia

He indicates there are two general types of progress. In the first type the infection remains generally over the outer surface of the mandible, with early trismus and a swelling which remains a long time, and is followed by exfoliation of sequestra. In this type conservative treatment is advised and resolution is the rule.

In the second type the infection is principally on the inner surface of the mandible, and extends along the facial planes; this results in difficulty in swallowing and in speech. The patient becomes ill more rapidly and requires more rapid surgical treatment to avoid serious complications. A general anesthetic is administered, usually by nasal tube, and the throat is packed. The table is tilted so that the head is raised, and incision is made; usually pus is discovered and a rubber-tube drain is used.

Several cases of both types of infection are cited.

CHARLES W. FREEMAN, D.D.S.

Padgett, E. C.: Osteomyelitis of the Jaws. *Surgery*, 1940, 8: 821.

The author presents a study of 59 cases of "frank" osteomyelitis of the jaws, exclusive of those secondary to fracture. A maxim drawn from the study of cases of osteomyelitis of the jaws due to pyogenic infection is that treatment should be conservative during the early stages, but fairly thorough and somewhat radical after sequestration has been effected.

This condition occurred in practically all ages. Males were more frequently afflicted, and involvement of the lower jaws was more common. Peridental infection was associated in about one-third of the cases. Extraction of a tooth during an acute pulpitis or peridental infection led to osteomyelitis in 11 cases. Trauma to the jaw in the region of the tooth initiated the infection in 5 patients. In 29 patients the condition resulted from other causes. These included: blood-borne infection, syphilis, excessive irradiation, noma, trauma to the cheek, leucemia, and infection of the maxillary sinus.

It has previously been demonstrated that streptococcus hemolyticus is the most common organism associated with peridental infection, and that staphylococcic and mixed infections occur less commonly. When the infection is blood-borne, the staphylococcus aureus is frequently found.

The pathology of osteomyelitis of the lower jaw is influenced by two factors: (1) the presence of dental elements, and (2) a unique blood supply. In the upper jaw two additional factors modify the changes: (1) the fact that the bone is of membranous origin, and (2) the presence of the maxillary sinus.

As the products of inflammation accumulate under tension, the vessels within the bone spaces become thrombosed. The pus follows the path of least resistance through the bony cortex, eventually perforates the cortex, and elevates and then ruptures the periosteum. This results in the separation of dead bone and the formation of a sequestrum which is usually complete in two or three months. As long as dead bone is present the opening in the periosteum will persist, and pus and débris will drain. The maxilla, however, is a membranous bone and therefore lays down little or no new bone. If the cementum of the tooth and the peridental membrane are disrupted, the cementum remains as a foreign body. Unerupted teeth may similarly become foreign bodies if their blood supply is destroyed. If a wide area of periosteum is stripped from the bone and the central blood supply is blocked, complete necrosis of the bone may occur.

The local symptoms usually consist of a severe, aching, throbbing, deep-seated pain, with local tenderness, swelling, and, eventually, fluctuation. With rupture of the periosteum relief may ensue. Extension of the pus from the lower jaw may then occur into the submaxillary region, upper neck region, or region of the anterior pillars. Trismus may be marked. The systemic symptoms may be severe.

A few cases may show gradual bone absorption without actual sequestration. In infants the condition results from a septicemia and the organisms may be particularly virulent. Extensive damage to the tooth beds in children may cause marked interference with growth of the jaw and lead to serious deformity.

The outstanding features of irradiation necrosis are the chronicity of the course, the continued pain, the slowness of sequestration, lack of tendency for either the bone or the surrounding soft tissues to show any of the ordinary tendencies of normal tissues toward healing, and, finally, the lack of resistance to secondary infection.

In children it is sometimes difficult to determine if one is dealing with a temporomandibular arthritis or osteomyelitis, and about the only distinguishing feature is the fact that the point of maximum tenderness is lower in osteomyelitis.

The roentgenograms usually show some early mottling of the bone, and in six or seven weeks a hazy moth-eaten, uneven outline between the edges of the live and dead bone becomes evident. Later, the sequestrum loses some of its density. Repeated roentgenograms over a period of from six to nine months may be necessary in order to be sure there is sufficient new bone to avoid jeopardizing the contour of the lower face when the sequestrum is removed.

Whether or not one should extract a tooth during the acute stage of peridental infection depends upon the amount of trauma inflicted in removal of the tooth, as well as the virulence of the infection and resistance of the patient. If the infection does not have the clinical signs of great virulency, early extraction with little trauma is generally beneficial, but if considerable trauma must be inflicted the reverse is true. The situation is analogous to doing radical surgery in the course of acute osteomyelitis of a long bone. The fact that the streptococcus hemolyticus is the usual infecting organism should make one conservative when in doubt as to the method of treatment.

After the development of true osteomyelitis, the author treats the patient conservatively during the acute phase, and drains the soft tissues when localization is apparent. If internal drainage seems inadequate submandibular drainage is used. When sequestration is complete the sinus tract is followed and opened, the dead bone is removed, overhanging edges of bone are excised, and the wound is loosely packed with iodoform gauze.

Thirty-four patients with pure pyogenic osteomyelitis were cured after one operation; 3 had more than one sequestrectomy. None of these patients died. Three others with associated leucemia, and 2 with radiation necrosis, died.

The author reports 2 cases of chronic progressive osteomyelitis of the maxilla, the base of the skull, and the frontal bones, which followed antral infection and trauma. Each case had a progressive course leading to death from meningitis in about eighteen months. JOHN A. GIUS, M.D.

EAR

Brunner, H.: Disturbances of the Function of the Ear After Concussion of the Brain. *Laryngoscope*, 1940, 50: 921.

Brunner deals only with concussion of the brain and the affections of the ear after concussion of the brain. Broadly speaking, all of these injuries are caused by some blunt force which has a wide point of impact against the skull. Either the skull is struck a blow or it is set into rapid motion by a fall and suddenly comes to rest against some broad, solid substance. Although there is no uniformity of opinions concerning the physiological changes in concussion of the brain, recent studies support the theory that derangement of the cerebral circulation is responsible for many of the sequelæ. These sequelæ can be detected microscopically, by encephalography, by clinical examination, and by otological examination.

Microscopic examination reveals hemorrhages of the meninges which lead to a thickening of the meninges and an obliteration of the meningeal spaces and, consequently, to a disturbance of the circulation of the spinal fluid. Further, there are numerous dot-like hemorrhages, foci of crushing, and fiber and systemic degeneration in various parts of the brain and spinal cord. Degenerative changes occur in the nuclei of the cochlear and vestibular nerves. Encephalographic examination emphasizes the following points: (1) there are cases with definite concussion of the brain associated with a normal encephalogram; (2) a definite hysterical constitution may be combined with a pathological encephalogram; (3) there are cases with a pathological encephalogram but without any complaints.

After concussion of the brain, a syndrome can be observed which consists of headache, dizziness, inordinate fatigue on effort, intolerance to intoxicants, vasomotor instability, tinnitus, nausea, glittering, emotional instability, psychical depressions, psychical irritability, and diminution of the abilities to remember and to concentrate. This syndrome is organic, due to the microscopic and encephalographic changes of the brain, although psychogenic factors very frequently complicate the clinical picture if the socio-economic and other difficulties following the trauma last long enough.

In many instances it is difficult to distinguish between a concussion of the inner ear and a longitudinal fracture of the temporal bone. There is less difficulty in distinguishing between a plain postconcussion syndrome, which is a disease of the brain alone, and a postconcussion syndrome combined with disease within the temporal bone. In the latter there generally is a definite impairment of hearing; in the postconcussion syndrome there is, as a rule, no definite impairment of hearing. Generally, the plain postconcussion syndrome does not include marked cochlear symptoms.

In using the clinical rather than the psychological approach to vertigo, Brunner separates from the general term "vertigo" a specific sensation called "labyrinthine vertigo." The latter implies a whirling or tactile type. He considers the labyrinthine vertigo as an otological symptom and as the most important otological symptom as far as the postconcussion syndrome is concerned. In differentiating between a labyrinthine vertigo and a non-labyrinthine vertigo the following objective symptoms prove the existence of even a slight labyrinthine vertigo: the finding of spontaneous nystagmus, the finding of nystagmus after quick head movements, and the findings by means of the labyrinthine tests.

The postconcussion syndrome complicated by fractures of the temporal bone is much more serious than a plain postconcussion syndrome. The symptoms of the postconcussion syndrome are sublimated by the symptoms of the fracture. In the postconcussion syndrome complicated by concussion of the inner ear, the symptoms of the concussion of the inner ear predominate. NOAH D. FABRICANT, M.D.

NOSE AND SINUSES

Kramer, R., and Som, M. L.: Intracranial Pathways of Infection from Diseases of the Sphenoid and Ethmoid Sinuses. *Arch. Otolaryngol.*, 1940, 32: 744.

Numerous textbooks and special articles have tabulated various pathways and modes of intracranial involvement from sphenoid and ethmoid infections. With the exception of a few instances, no proof has ever been offered to substantiate the existence of the assumed pathways. Kramer and Som have been able to demonstrate the source of infection in cases of bacterial meningitis of so-called undermined origin. Even after a complete postmortem examination at the Mount Sinai Hospital the source of the infection had in many instances remained unknown until serial sections of the sinuses revealed the primary infection. The authors stress this point because they have found that paranasal sinusitis may be the origin of intracranial complications even if gross examination reveals no abnormality. Macroscopic evidences of an infection were observed in but 3 of 50 sinus blocks studied.

A frequent finding in cases of meningitis resulting from inflammation of the sphenoid and ethmoid sinuses is the primary submucosal abscess. Although obvious microscopically, such abscesses are difficult to recognize at operation or post-mortem examination. Because the authors have encountered them so often they believe that at operation it would be advisable to strip the mucosa of the sphenoid sinus in cases of meningeal irritation. It would appear that this is a more logical procedure than only the institution of adequate drainage. Spread to the meninges occurs by way of osteomyelitis and osteitis; through the perineural olfactory lymph sheaths; by lymphatic extension through perivascular lymph channels; through vascular spread by venous channels; by direct invasion of the meninges through congenital bony defects; and from a persistent cranial pharyngeal pouch.

NOAH D. FABRICANT, M.D.

PHARYNX

Vívoli, D., and Bertelli, J. A.: A Contribution to the Study of Tuberculosis of the Tonsils (Contribución al estudio de la tuberculosis amigdalina). *An. de la cátedra de patol. y clin. de la tuberculosis*, 1940, 2: 193.

The authors state that primary tuberculosis of the tonsils is rare and that its frequency of occurrence has been estimated at from 1 to 1.5 per cent. The tentative diagnosis is based on the familial antecedents, the milieu, and some personal signs of the patient, among which may be mentioned the general aspect, pallor of the soft palate, cervical adenopathy of stationary type, prolonged suppuration of the ear, involvement of the larynx, sarcoids, erythema nodosum, and recurrent angina. Swollen cervical lymph nodes, which are located preferably under the mandibular angle and are resistant to any treatment, are considered as a constant and important sign of tuberculosis of the corresponding tonsil, especially if there is no localization in the upper respiratory and digestive tracts or in the lungs. Histological examination is the only means of establishing a sure diagnosis, and serial sectioning of the tonsil is imperative. The mere presence of tubercle bacilli cannot be accepted as confirmation of the diagnosis, because at times the bacteria are located in the crypts without causing any reaction, or they may have been carried accidentally into the tissue by the microtome; typical lesions must be found, such as Koester's follicles and giant cells.

The tonsils may be infected secondarily by the sputum in patients with open pulmonary lesions and by the circulatory route. Histologically, the presence of giant-cell follicles in the vicinity of the small vessels located in the depth of the tissue militates in favor of a hematogenous infection, while their presence in the vicinity of the crypts favors an exogenous origin.

From the clinical point of view, tuberculosis of the tonsils is divided into larval and frank forms. The larval forms include simple hypertrophy, tonsillar adenitis which is a form of subacute hypertrophic tonsillitis, and cryptal tonsillitis which is the most frequent manifestation of tonsillar tuberculosis. The frank forms consist of acute tuberculosis, chronic ulcerating and ulcerocaseating tuberculosis which is the most frequent form, and lupus. Five cases are described.

The authors have made a histological study of 80 excised tonsils in an attempt to form an opinion on various points on which there is marked disagreement in the literature. For instance, the frequency of occurrence of larval tuberculosis has been variously estimated at from 1.10 to 12.75 per cent of all extirpated tonsils in subjects considered as being clinically healthy. In the authors' series, all individuals who were operated upon presented acute tonsillitis, non-specific hypertrophy, or signs of ordinary tonsillar infection. There were 20 undoubtedly tuberculous patients in whom the superficial examination of the tonsils did not cause any suspicion of the nature of their contents; tuberculous lesions were found in 3 tonsils, and showed that 15 per cent were larval forms. The remaining 60 tonsils were obtained from non-tuberculous subjects who lived with or were directly related to tuberculous patients and some of whom presented slight adenopathy of the mandibular angle, probably because of the tonsillar focus of the infection; no sign of tuberculosis was found in any of these tonsils. On the other hand

histological examination in 2 patients who did not belong to the former series and were suspected of having diphtheria showed that the angina was of tuberculous nature.

It is generally admitted that tuberculosis of the tonsils occurs between the ages of twenty and forty years; however, the tonsils of the only tuberculous child whom the authors have been able to study up till now contained typical tuberculous lesions. They think that a histological examination should be made of all tonsils removed from patients who have large adenopathies. RICHARD KEMEL, M.D.

Martin, H. E., and Blady, J. V.: Cancer of the Nasopharynx. *Arch. Otolaryngol.*, 1940, 32: 692.

Cancer of the nasopharynx includes all malignant growths arising on the walls of this cavity. Cancer in this area occurs most often on the posterior wall, in the region of the nasopharyngeal tonsil, with its lateral extensions into the recessus pharyngeus, and next in frequency on the lateral walls, on the ridge which surrounds the orifice of the eustachian tube. Occasionally a growth may originate somewhat lower on the posterior wall, near the junction of the nasal and oral pharynges. The floor of the nasopharynx and the anterior wall practically never give rise to cancer.

In the series of 87 cases reported, 84 per cent of the growths were some form of epidermoid cancer, with malignant tumors of the salivary glands comprising 3 per cent. Fifty-six of the epidermoid cancers were transitional-cell carcinomas or lymphoepitheliomas. Highly differentiated squamous-cell carcinomas and spindle-cell carcinomas made up 12 per cent. Within the past year, 2 histologically unusual neoplasms of the nasopharynx have been seen at the Memorial Hospital, Philadelphia, one a myxosarcoma, and the other a notochordal tumor.

Cancer of the nasopharynx makes up about 2 per cent of all malignant growths of the head and neck. Because of the absence in many cases of early local symptoms in the nasopharynx, the diagnosis is frequently delayed or missed entirely. The disease is characterized by early metastasis to the cervical lymph nodes and extension to the cranium and to the orbit. The surgical inaccessibility of the primary lesion and its high radiosensitivity make irradiation the treatment of choice, and a combination of external and intracavitary irradiation gives the best results. Cervical metastases from this rapidly growing, highly anaplastic tumor also are best treated by irradiation. NOAH D. FABRICANT, M.D.

NECK

Clerf, L. H.: Cancer of the Larynx; An Analysis of 250 Operative Cases. *Arch. Otolaryngol.*, 1940, 32: 484.

This report is based on an experience with 250 cases of cancer of the larynx treated by laryngofissure or laryngectomy. The youngest patient was a woman twenty-one years old. The oldest patient treated by laryngofissure was seventy-eight years of age and the oldest laryngectomized patient was seventy-seven years old. Although impressions commonly are misleading, the author has long been impressed with the idea that there is a hereditary tendency in cancer. There was history of cancer occurring within two generations in 41 instances. Excessive use or abuse of the larynx probably is a predisposing factor. The occupation of 59 patients necessitated excessive use of the larynx.

End-results of surgical treatment of cancer of the larynx are influenced by the extent of involvement, the location of the growth, and the degree of malignancy.

True cordal cancer should be treated by laryngofissure; cancer limited to the anterior commissure may be successfully treated by laryngofissure if a large segment of the overlying thyroid cartilage is removed. Laryngectomy gives better results than laryngofissure in cases of subglottic cancer.

Employment of local anesthesia, prevention of the inspiration of blood into the tracheobronchial tree during operation, and prompt aspiration of secretions from the trachea after operation will decrease the incidence of postoperative pulmonary complications. JOSEPH K. NARAT, M.D.

Martin, H. E.: Selection of Treatment for Cancer of the Larynx. *Ann. Otol., Rhinol. & Laryngol.*, 1940, 49: 728.

In selecting the treatment for an individual case of cancer of the larynx, radiation and surgery, the two accepted methods, are often considered only from their competitive standpoints; in other words, one or the other is advanced by its proponents as offering a complete solution to the problem of laryngeal cancer. The author set out to point out the futility of such a partisan concept, to discuss the unique merits and limitations of both methods, to show that each is indicated in a particular form of laryngeal cancer, and that in some cases a combination of the two is superior to either method used alone.

The treatment of laryngeal cancer by any method is accompanied by definite hazards and is unjustified in the absence of histological proof of the presence of cancer. In every case, therefore, a biopsy is a prerequisite to the selection of a treatment method.

This discussion is based upon the premises that (1) cancer of the intrinsic larynx is mainly a surgical problem and usually unsuited to radiation therapy, and (2) cancer of the extrinsic larynx is mainly a radiation problem, practically all cases being inoperable at the time of the first examination.

Cancer of the intrinsic larynx or vocal cords is, for the most part, well differentiated squamous carcinoma of Grade I or II, which at this site usually grows slowly, rarely metastasizes, and is highly radioresistant. Such growths fulfill most of the conditions favorable to surgery; that is, the disease may be diagnosed early; direct extension is limited for a considerable time by the barrier of the cartilaginous

box of the larynx; and the lesions may be removed surgically with a safely wide margin by either partial or total laryngectomy, the latter depending upon the local extent of the growth. On the other hand, cancer lethal radiation for these highly radioresistant growths, centered directly on the vocal cords, is attended by a number of serious sequelæ, including persistent lymphedema of the glottis and late radionecrosis involving the cartilages. This does not imply that these growths can never be cured by radiation, but rather that surgery will produce far more cures with fewer dangerous complications. The argument that radiation is preferable because it preserves the vocal cords intact is hardly adequate, since the loss of the speaking voice is not too high a price to pay for the additional security.

In cancer of the extrinsic larynx these conditions are reversed. Malignant tumors of the epiglottis, the aryepiglottic folds, and the arytenoids, are mainly highly malignant, poorly differentiated epidermoid carcinomas or lympho-epitheliomas. They grow rapidly, and metastasize early and often bilaterally. Unlike intrinsic cancer, these extrinsic growths are often highly radiosensitive.

Referring again to the surgical treatment of cancer of the intrinsic larynx, there are two accepted procedures: (1) partial laryngectomy—often referred to as laryngofissure or hemilaryngectomy—and (2) total laryngectomy. In small growths limited to the anterior two-thirds of one cord, not invading the anterior commissure nor extending back of the vocal tubercle, partial laryngectomy should be advised. If the lesion extends across the anterior commissure onto the opposite cord with only moderate vertical extensions above and below the glottis, the patient is definitely happier with the lesser operation since he can at least force some air into the hypopharynx and produce audible speech. For more advanced cancer of the intrinsic larynx, total laryngectomy is necessary.

Not all advanced cases are incurable simply because they are inoperable. Treatment may be given by a permanent laryngostomy with the implantation of radon seeds. This method requires the use of a special instrument or laryngostat to maintain the patency of the laryngostomy opening. Such a combination of surgery and radiation has been successful in the author's clinic in about 50 per cent of the selected cases in which it has been used.

In all cases, careful examination should be made before operation for enlargement of any cervical nodes. The author does not believe that total laryngectomy can be combined safely with neck dissection at the same operation.

For cancer of the extrinsic larynx, there can be little question that radiation is the method of choice, since this growth can seldom be removed with a safely wide margin by the standard forms of total laryngectomy. Lateral pharyngotomy, as recently popularized by Trotter, is a technically feasible operation, and furnishes only a means of approach to the pharynx, but provides no method of excising an inoperable growth in this region. It must be recognized, however, that surgery has a definite part in radiation therapy. In some cases radiation may increase the local swelling so that tracheotomy is necessary. In others, the growth itself or the radiation reaction may produce sufficient obstruction in the pyriform sinuses so that sufficient nourishment cannot be obtained, and nasal tube feeding or even gastrostomy may be required.

JOSEPH K. NARAT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Ray, B. S., and Wolff, H. G.: Experimental Studies on Headache; Pain-Sensitive Structures of the Head and Their Significance in Headache. *Arch. Surg.*, 1940, 41: 813.

Using 30 patients carefully selected from a much larger group, the authors made studies on the sensitivity of various structures about the head by means of direct stimulation. These structures included the scalp, bones of the skull, dura mater, and brain, as well as the contained arteries, veins, and sinuses.

A great deal of interesting data is given which describes in detail the results of these stimulations and the local and referred pain which was produced. An insight is thus gained into the possible mechanism of certain types of headache.

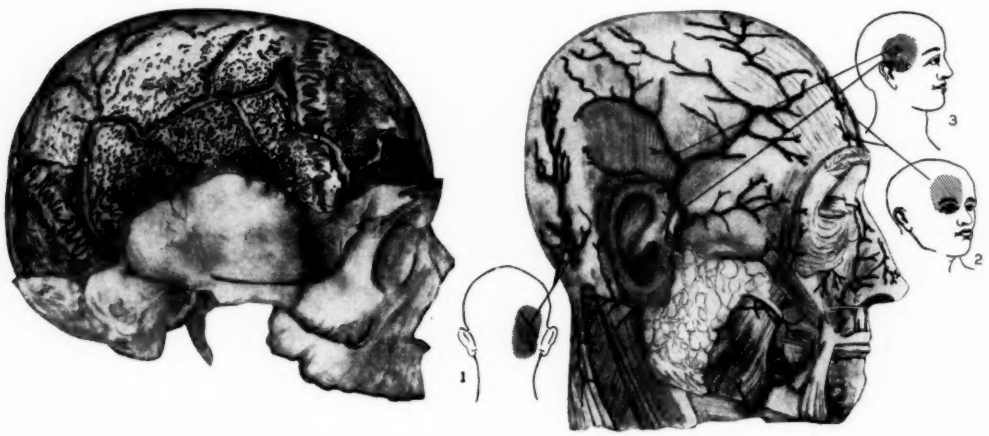
All of the five layers of the scalp and the contained arteries are sensitive to pain. The basilar dura, the dural arteries, the dural venous sinuses, and the basilar cerebral arteries are all sensitive to pain. The bone of the skull (including the emissary veins and diploic sinuses), the parenchyma of the brain, the ependyma and chorioidal plexuses, and the greater part of the dura and piarachnoid are not sensitive to pain.

When stimulation was applied to intracranial pain-sensitive structures on or above the superior surface of the tentorium cerebelli, pain could be produced in various areas in front of a line drawn across the top of the head from ear to ear, whereas pain-sensitive structures on or below the inferior surface of the tentorium were associated with painful sensations in various regions behind this line. In the first instance, the pain pathways are contained in the trigeminal nerve; in the latter, the pathways for the painful impulses are chiefly in the glossopharyngeal, vagus, and upper three cervical nerves.

There are 6 basic mechanisms which seem to produce headache:

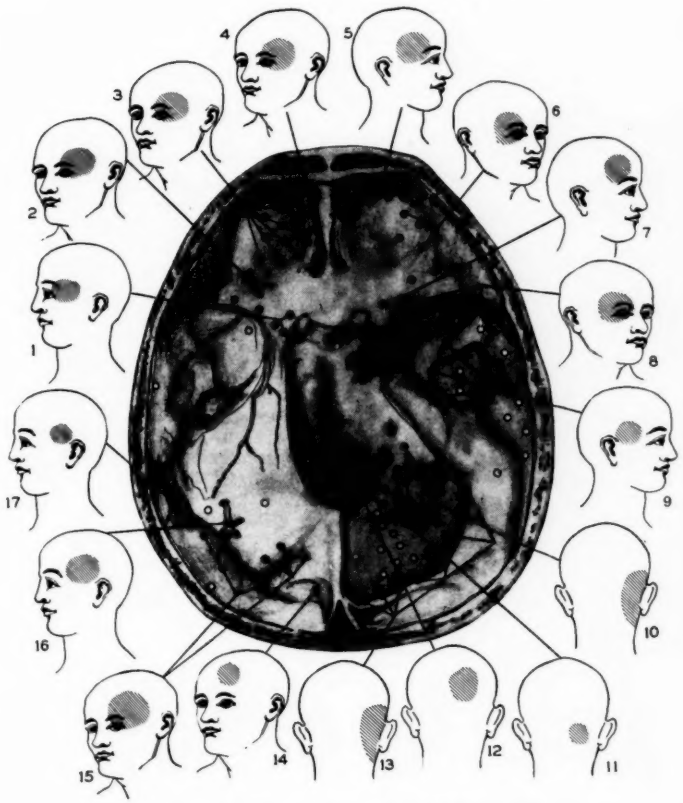
1. Traction on large cerebral veins and displacement of the dural venous sinuses
2. Traction on the middle meningeal artery
3. Traction on the large basilar arteries
4. Distortion or dilatation of any artery in or about the head
5. Inflammation involving or situated near any of the pain-sensitive structures of the head which have been named
6. Direct pressure of a tumor on cranial or cervical nerves containing pain-bearing fibers from the head

Headache from intracranial disease is most often a referred pain, but "local tenderness of the scalp



○ indicates the point of stimulation without pain.
● indicates the point of stimulation causing pain.

Fig. 1. a, view of the diploic and emissary veins of the cranium. b, view of the arteries of the scalp. The diagrams show the area of pain following stimulation of (1) the occipital arteries; (2) the supra-orbital and frontal arteries, and (3) the superficial temporal artery.



○ indicates the point of stimulation without pain.
● indicates the point of stimulation causing pain.

Fig. 2. View of the dural floor of the skull, the tentorium cerebelli and the adjacent venous sinuses and venous tributaries. The diagrams show the area of pain following stimulation of (1 to 8) the dura of the floor of the anterior fossa; (9 and 17) the middle meningeal artery; (10 to 12) the dura of the floor of the posterior fossa; (13) the inferior wall of the transverse sinus; (14) the superior wall of the torcular Herophili; (15) the superior wall of the transverse sinus and upper surface of the tentorium cerebelli; and (16) the inferior cerebral veins.

may serve as an index to the structures responsible when a lesion produces direct irritation of pain sensitive structures." JOHN MARTIN, M.D.

Horrax, G.: A Proposal for the More Radical Treatment of Gunshot Wounds of the Brain. *Canadian M. Ass. J.*, 1940, 43: 320.

Important technical adjuncts accruing to the neurosurgical field since the last war may lower the mortality of gunshot and shell wounds of the skull and brain. Two types of wounds are considered: (1) the "gutter wound" in which the missile goes through the scalp and cuts a gutter in the skull, from which it is deflected, and in which case bone fragments only are showered into the brain; and (2) the penetrating wound proper, in which the missile enters the skull and lodges in the brain together with the bone fragments that are usually carried along with it.

The treatment of these wounds in the last war, as developed especially by Cushing, is described. Electrosurgery and the use of strong suction apparatus permit neurosurgical operations of much greater magnitude than was possible during the last war. It is also evident that many brain areas can be wholly or partially removed without detriment to the individual. With these two facts in mind it is possible to visualize a much more thorough débridement of

brain wounds than that which was practiced during the first World War.

It would seem that the technique for the present treatment of gunshot wounds of the brain should be as follows:

Prophylaxis. Soldiers should go into action with short-cropped hair; tetanus toxoid should be given prophylactically; and if tetanus toxoid has not been given, tetanus antitoxin should be administered after wounding and again after subsequent operation.

Pre-operative preparation. The whole scalp should be shaved, which ensures against the overlooking of small, multiple wounds, and allows extension of operative incisions in a clean field, if they are necessary; stereoscopic roentgenograms should be made of the skull in all head wounds; and neurological examinations should be made to correlate the objective findings with the area of known damage and as a means of gauging the patient's progress.

Operative procedure. The preliminary part of the operation on penetrating brain wounds would include the usual careful débridement of the scalp, periosteum, and bone, as carried out in the World War. By electrosurgical means the area of dural penetration should be excised, well outside of the hole in the dura so that an area of brain, of at least 3 cm. in each of two diameters, is exposed. The area may of necessity be much larger than this. Then in the normal brain tissue, the same type of débridement can be carried out on the track in the brain as was performed in the overlying tissues. This would be accomplished by the combination of electrosurgical excision around the track together with the use of strong suction. With the electric current constantly applied to the metal suction tube, the soft brain surrounding the track, together with the contents of the track itself—clots, disorganized brain, hair, bone, and metal fragments—could be evacuated, while the uninvolved brain beyond the area excised would be kept free of contamination to a very large extent because of the heat of the metal tube. With the use of light retractors or flat spatulas, the débridement could be accomplished under direct vision and thus all the foreign matter secured. With suction sufficiently strong, most of the bone fragments and the smaller metal fragments could probably be evacuated because of their adherence to the end of the suction tube. In through-and-through wounds débridement should be carried out from both the wound of entrance and the wound of exit.

It seems more than probable that a far better débridement of all brain wounds could be accomplished by the methods thus indicated than was ever possible with the older procedure, and probably in far less time. This would mean that more operations could be done, and that a greater proportion of the patients would survive, as in most instances complications were found to have developed because of incomplete primary débridement.

JOHN L. LINDQUIST, M.D.

Coblentz, R. G.: Cerebellar Subdural Hematoma in an Infant Two Weeks Old with Secondary Hydrocephalus. *Surgery*, 1940, 8: 771.

Subdural hematomas have received considerable attention recently. Good descriptions have been given of subdural hematomas over the hemispheres in infants, but the author describes a rare form of subdural hematoma occurring in an infant two weeks old. This particular infant had a cerebellar subdural hematoma following intracranial hemorrhage in the posterior fossa. A case report is appended which is adequate and conclusive. The main points are as follows:

There was gradual enlargement of the head, bulging of the fontanels, and a separation of the sutures. The child gradually became drowsy. There was no elevation of the optic discs, and no abnormalities of the reflexes were noted. The leucocyte count was 10,300. X-ray examination of the head revealed marked separation of the cranial sutures. The spinal fluid was grossly bloody, in a xanthochromic fluid. Daily spinal punctures were employed, and the fluid became light straw-colored. At this time bilateral subdural taps through the coronal sutures showed clear fluid on both sides. The ventricles were tapped and 100 c.cm. of fluid were removed and replaced by air. The ventricular system showed symmetrical dilatation of the entire system. Under ether anesthesia, and through a small incision, the dura of the posterior fossa was exposed and a clot containing 30 c.cm. of dark, rusty fluid was tapped immediately subjacent to it. The child made an uneventful recovery.

ADRIEN VERBRUGGHEN, M.D.

Bubenzer, H.: Colloid Cyst of the Foramen of Monro Successfully Treated by Operation (Ueber eine erfolgreich operierte Kolloidcyste des Foramen Monroi). *Nervenarzt*, 1940, 13: 312.

Bubenzer states that only about 1 colloid cyst of the foramen of Monro is found among from 250 to 300 tumors of the brain and that up till now about 25 operated cases have been reported, of which 75 per cent of the patients have survived the intervention. The diagnosis can be established only by means of ventriculography. A case is described.

Since three months, a man aged thirty years had headaches which increased in severity and finally became localized in the back of his head. He kept his head immobilized and bent forward toward the left because he felt less pain in this position. He had also a tickling sensation in the left half of the tongue and palate, stitches in the left ear and temple, and, lately, double vision when looking to the left. He had vomiting and little desire to work; he was forgetful and irritable. He offered resistance to passive movements of the head, and his skull was generally painful to percussion. There was no limitation of the field of vision, but a stasis papilla of 2.5 D. The pupils were deformed, but reacted well. He had no paralysis of the muscles of the eyes, but a mimic facial paresis on the right. There were no sensitive or motor disturbances.

Roentgen examination showed the picture of an internal hydrocephalus which was caused by an obstruction in the third ventricle. Ventriculography was then undertaken. The two lateral ventricles were punctured at the same time and it was found that the pressure of the cerebrospinal fluid was high on both sides; 280 c.cm. of fluid were removed and replaced by air, and another reontgenogram was taken. The right ventricle was somewhat larger than the left and the sagittal exposure showed that the left third ventricle was only slightly filled. Several exposures were then taken and made it appear probable that the third ventricle was reduced in size by a tumor compressing it from above; 220 c.cm. of the removed fluid were reinjected and the operation was started with the cutting of a Dandy flap on the right side, under local anesthesia. The cerebral convolutions were found to be flattened. The right, enlarged lateral ventricle was opened with a small incision and a bluish cyst, having a gelatinous content, was discovered inside the foramen of Monro. It was possible to detach the wall of the cyst from the plexus without hemorrhage; the ventricle was then filled with saline solution. Paresis of the left leg and arm occurred which, however, regressed after some time. During the first days after the operation, there was excessive formation of cerebrospinal fluid which was removed every day by puncture, while dietary fluids were restricted. The patient was discharged as cured after six weeks: headaches and stasis papilla had disappeared as well as the mental disturbances. Histological examination revealed an ependymal cyst lined with ciliated epithelium.

Opinions differ greatly on the origin of these cysts. Foerster thinks that in the midbrain, in which subependymal cysts are found during embryonic life, such colloid cysts may develop later, while Hochstetter considers them as remnants of the embryonic paraphysis. This concept is also defended by the American authors who therefore call these cysts "paraphyseal cysts." Their diagnosis is difficult and is only possible by means of ventriculography. The symptoms are caused by obstruction of the foramen of Monro. The best surgical access is obtained through the frontal lobe according to Dandy's method. Intervention should always be tried because of its relatively favorable prognosis.

(Bruening). Richard Kemel, M.D.

SPINAL CORD AND ITS COVERINGS

Munro, D.: Care of the Back Following Spinal-Cord Injuries. *New England J. Med.*, 1940, 223: 391.

Provided the skin is primarily undamaged, bed and pressure sores develop only because of secondary destruction of local tissue. The occurrence and extent of this destruction depend on the presence of a bony weight-bearing prominence close beneath the skin, the thickness of the padding tissue between the bone and the skin, the length of time that the constant weight-bearing is permitted over this point, and the integrity of the protective horny layer of the skin. To produce tissue destruction, local anoxia and anemia must be present in addition to these factors.

Local compression of the skin at first produces pallor, which is followed by a flare. A more prolonged reaction produces local tissue asphyxia which may be associated with wheals or blisters. This is a vasodilatation produced by an abnormal amount of local metabolic substances. In addition, prolonged pressure on the skin first causes pain, and then local anesthesia. This local reaction produces pressure sores. When in addition to the above local changes there is added failure of the autonomic vasomotor responses then bed sores are produced.

In an analysis of 12 cases of spinal-cord and cauda-equina injuries Munro found that 24 per cent developed bed sores. Bed sores occurred in 54 per cent of 26 thoracolumbarcord injuries, and in 18 per cent of cervical and cauda-equina injuries.

The author's method of treatment of bed sores is as follows:

If the early signs of a pressure sore appear, the hyperemic areas are painted with tincture of benzoin twice in twenty-four hours. If the pressure sore develops into a bed sore or if the tissue destruction is merely the local type that goes with a pressure sore, the skin edge around the ulcers is treated in the same way. Sloughs and gangrenous tissues are never cut off but are allowed to stay in place until they fall off. Abscesses are tapped and emptied through the needle. Incision and drainage is contraindicated. Ulcerated areas that are infected with streptococcus hemolyticus are dressed with gauze saturated in a solution of sulfanilamide. Zinc peroxide should be used if the infection can be shown to be a micro-aerophilic hemolytic streptococcus. Other ulcerated surfaces are wiped clean twice in twenty-four hours. No local application is used. High vitamin and high protein diets, transfusions, adequate fluids, appropriate chemical treatment of the bacteriuria always present, and physiotherapy are adjunct measures.

In the past Munro has tried and discarded all the ordinary forms of local applications, including tannic acid, gentian violet, scarlet red, enzymol, strapping of the ulcer, all types of ring supports, Bradford frames, sawdust beds, and lamb's wool pads. He has also discarded all types of mattresses except the one of sponge-rubber which promises to be helpful.

In addition, it is essential that the bed be kept absolutely dry by applying tidal drainage; that all forms of splinting of the back, while the patient is bedridden, be avoided; and that the patients, especially those with thoracic injuries, be turned every hour, their backs being rubbed, dried, and powdered at each turning. David J. Impastato, M.D.

De Leo, F.: The Trophic Syndrome of Spina Bifida Occulta (Sindromi trofiche da spina bifida occulta). *Clin. chir.*, 1940, 16: 385.

The author regrets the fact that, as judged by reports in the literature, so little importance has

heretofore been attached to the possibilities of trophic changes in the lower extremities in children with spina bifida occulta. Such changes may be the direct result of such a defect, which was commonly supposed to bear but little pathological significance. He cites the case histories of several patients whom he has observed and operated upon, and he illustrates their developmental defects by photographs and roentgenograms.

The defects which occur may be either unilateral or bilateral. One limb may be shorter than the other, and various combinations of paralyses occur. All or several toes may be deformed by absent or grossly altered formation of the phalanges. Areas of complete sensory loss may cover several segments, and chronic ulcers are a frequent component of the clinical syndrome. Such changes, of course, are due to a myelodysplasia, and gross or microscopic changes in the spinal cord and its roots may be entirely out of keeping in their severity with the roentgen-ray evidence of the congenital defect.

Operation may reveal a dense fibrous tract leading from the subcutaneous level deep into the bony defect, which may involve the cord in scar-like tissue. Abnormal ossification *within* the vertebral canal at the site of the posterior bone defect may be the basis for the neurological defects. Pseudotumor (fibrous, ossified masses in the defective hiatus) or actual meningocele with root contents may be disclosed at operation).

Operation can accomplish some semblance of restitution of the normal anatomy and a freeing and replacement of any involved nervous structures. Physical therapy both before and after operation is a valuable adjunct which should not be overlooked, and the care of trophic ulcers alone may be a problem of major difficulty. JOHN MARTIN, M.D.

PERIPHERAL NERVES

Doubroff, J. G.: Wounds of Peripheral Nerves (Verletzungen peripherer Nerven). *Ortop. i travmat.*, 1940, 14: 43.

There is no accord among the various statistics on the frequency of peripheral nerve injuries in war wounds. While most authors in their statistics include only severe injuries of peripheral nerves and thus report a frequency from 1 to 4 per cent, one can increase this figure to 12 per cent or more by considering the reports of those authors who include the slightest nerve injuries. According to Franz one must reckon with complete section of the nerve in 3.23 per cent of cases. For the following nerves the decreasing order of their frequency of involvement is: the radial, median and ulnar, sciatic, the brachial plexus, the peroneal nerve, and, last, the tibial nerve. One must differentiate between direct nerve injuries occurring at the site of a wound, and indirect injuries which develop as a result of secondary pathological processes active in the vicinity of nerves. Moreover, nerve injuries may occur as a result of stretching, even when the nerves lie at a distance from the site of injury. One may divide traumatic nerve lesions into several types. There are those which develop as a result of pressure, and lead to mild or severe disturbances of nerve function and become apparent externally through the development of so-called pseudoneuromas. Further, there are those resulting from the exposure of a nerve followed by scar tissue formation about the nerve which in turn causes nerve damage. Finally, there are direct injuries completely severing a nerve, following which central and peripheral neuromas develop.

The management of nerve injuries due to wounds in the last war demonstrated that 60 per cent can be cured, while about 30 per cent of the cases will show improvement under conservative treatment. About 10 per cent are not benefited by conservative therapy. Conservative therapy consists of wound treatment and immobilization of the extremity in a suitable position. If evidence of paralysis persists, operation is indicated in the course of from two to six months. Nerve suture should be performed under local anesthesia if possible, since more satisfactory orientation is possible and confusion between nerves and tendons is more easily avoided.

In primary nerve suture, which may be undertaken when complete severance of a nerve occurs, all damaged fragments of the nerve should be removed since only then can a good outcome be expected. Hemostasis in the region of the nerve suture is also very important, since the presence of a hematoma favors connective-tissue proliferation which interrupts the growing nerve fibers. In order that nerve suture succeed there must not be the slightest tension. This condition can almost always be achieved through suitable fixation of the extremity. Nerve sutures should include only the epineurium. Sutures which touch the endoneurium lead to scar formation. For removal of neuromas a sharp scalpel or razor, never scissors, should be used.

A method of nerve suture described by Richter may be used to advantage; a cuff is made of the epineurium of the central neuroma and laid over the line of junction following the nerve suture. The outcome of secondary nerve suture depends very decidedly on the purposeful after-treatment (massage and electrotherapy). If approximation of the nerve ends is not possible because of too large a gap one may attempt a homoplastic nerve transplantation, although the benefits are slight at most. For irreparable paralyses suitable typical orthopedic operations and apparatus are indicated.

(B. HESSE). JOHN L. LINDQUIST, M.D.

SYMPATHETIC NERVES

Spiaggia, F.: Three Cases of Thrombo-Angiitis Obliterans Treated by Resection of the Splanchnic Nerves (Su tre casi di tromboangioite obliterante trattati con la resezione dei nervi splancnici). *Clin. chir.*, 1940, 16: 309.

It is pointed out that two distinct clinical entities may be encountered in which the caliber of the

arteries may be lessened: those, as in Raynaud's disease, in which the mechanism is one of a vasomotor fault, and those, as in Buerger's disease, in which thrombus formation obliterates the lumen of the vessel. The author has treated 3 cases of the latter category by resection of the splanchnic nerves, and he gives a detailed case history in each instance.

Buerger, Ghiron, and others have adhered to the theory that there is primarily a thrombus formation followed by an arterial lesion infectious in nature. Winiwarter, Vanzetti, and another group believe that the arterial lesion is primary and that the thrombus formation is secondary to it. In any event, it is conceded that exposure to cold, trauma, infectious disease, and tobacco predispose the individual to such arterial changes. Ghiron would divide the course of the disease into two stages: (1) the acute stage, when, during the incipiency of the thrombus, there is a thickening and acute inflammatory process progressing in the vessel walls, with perivascular infiltration of leucocytes and connective-tissue nodule formation in the vessel's lumen; and (2) the stage of organization of the thrombus, obliteration of the lumen, and a subsidence of the acute inflammatory process.

The operation of splanchnicectomy is based on the original observation of Oppel (and since accepted by others) that obliterating endarteritis is due to a hyperfunction of the adrenal gland and a superabundance of circulating adrenaline, in the presence of an actual infectious process in the vessel walls. Such an operation should theoretically gain what many another operation has attempted, such as unilateral adrenalectomy, partial bilateral adrenalectomy, medullectomy, denervation of the adrenal glands, partial capsulectomy, and alcoholic infiltration of the splanchnics. The author's operation consists of a supradiaphragmatic resection of the nerves done through a lower posterior approach. Results depend upon early treatment, and surgery should be instituted without delay when a diagnosis is made. Amputation may eventually have to be done, but this is less likely to be true if splanchnicectomy is done before arterial changes have progressed too far.

JOHN MARTIN, M.D.

MISCELLANEOUS

Huber, P.: Extirpation of the Stellate Ganglion (Exstirpation des Ganglion stellatum). *Zentralbl. f. Chir.*, 1940, p. 1116.

Huber reports the bilateral removal of the cervical sympathetic ganglion in 7 patients. Complete success already persisting for four years was obtained in a patient aged sixty-three years who had been suffering from Raynaud's disease, while a recurrence appeared after four months in another patient. In a case of obliterating endarteritis, it was possible only to avert the threatening gangrene, while the pains could not be influenced: the ganglion in this patient was found to be permeated with scar tissue and pigment.

Bilateral extirpation was undertaken in an attempt to improve the blood perfusion of the brain in a woman with bilateral cerebral embolism occurring after an extra-uterine pregnancy, but no decided result can be noted as yet because the time elapsed since the operation is still too short. Intervention on the left side has been unsuccessful in a case of angina pectoris, while removal of the right ganglion in a patient with neuroma of the right arm, resulting from a firearm injury, caused sudden freedom from pain, which has persisted for the past four months. The operation was performed according to the method of Rieder which has always fulfilled its purpose. Careful reconstruction of the tissues was always done. (MAX BUDDE). RICHARD KEMEL, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Atkins, H. J. B.: The Treatment of Chronic Mastitis; Definitions—Effects of Pregnancy, Estrogens, Androgens, Diathermy—Summary and Conclusions. *Lancet*, 1940, 239: 411.

In 1937 a clinic for the investigation and treatment of chronic mastitis was established at Guy's Hospital, London, by Bishop and Atkins. This clinic has been attended by 212 patients with pain or with lumpiness in the breast, or with both symptoms. Chronic mastitis was defined as "pain or lumpiness of the breast not due to bacterial inflammation, new growth, or fat necrosis." There are many individuals with periodic pain in the breast and lumpiness sufficient to distinguish the breast from the surrounding subcutaneous tissue. In practice, the use of the term "chronic mastitis" was confined to those cases in which the symptoms and findings were severe enough to warrant examination by a physician. The apprehensive individual with mild symptoms frequently was a patient, while the phlegmatic individual with the same condition would stay away. Thus the mental status of the patient was considered in evaluating the treatment.

The substances used in the treatment of chronic mastitis were studied from the clinical, and, as regards estrogens and androgens, from the histological aspects. In all cases inert pills or injections were administered before actual treatment was started in order to eliminate the psychological factor. Thirty-one patients were relieved by means of inert materials. This included those in whom the psychological element predominated and those in whom spontaneous resolution occurred. These patients received no further therapy. Six patients became pregnant. In 4, all symptoms disappeared between the fifth and sixth months, in 1 no relief occurred, and 1 failed to return for observation after ten weeks.

Estrogens in the form of estradiol benzoate were administered by injection; synthetic stilbestrol was administered by mouth. The patients were divided into two groups. In Group 1 the patients received less than 80 mgm. of estradiol benzoate in four weeks, or 280 mgm. of stilbestrol by mouth in eight weeks. There were 14 patients in this group. In 7 there were no changes, in 4 the condition became worse, and in 3 there was improvement. In Group 2 some patients received 80 mgm. of estradiol benzoate in four weeks, or 280 mgm. of stilbestrol in eight weeks while others received higher doses for longer periods. There were 19 patients in this group. In 7 there was no change, in 11 the condition became worse, and in 1 the pain was diminished but the lumpiness persisted. In this group histological changes were studied, and the authors believe that the changes were neither sufficiently constant nor extensive to warrant any conclusion from the small series examined. However, the impression was that estrogens cause an increase in fibroblastic activity, especially of the subepithelial fibrous tissue. This corresponds to the clinical findings and suggests that abnormal activity of estrogens may be a factor in the cause of chronic mastitis.

Androgens were administered in the form of testosterone propionate. The patients were divided into two groups: In Group 1 the patients received less than 400 mgm. of testosterone in four weeks. There were 12 patients in this group. In 6 the condition improved, in 6 others there was no change, and in 2 hair began to grow on the upper lip and chin, the voice deepened, and amenorrhea developed. In Group 2 some of the patients received 400 mgm. of testosterone in four weeks, while some received higher doses or equivalent doses over a longer period. There were 22 patients in this group. Nineteen showed improvement in their condition, in 1 the condition became worse, and in 2 it was unaffected. Some patients developed hirsuties, a change in voice, and amenorrhea. One patient developed cancer of the breast ten months later. Thus, while local improvement occurred, undesirable associated effects also occurred. These symptoms persisted for nine months after treatment had been stopped. Masculinization tends to occur mostly in younger persons, and the average age of this group was twenty-six years. However, in 1 instance a forty-year-old patient developed these symptoms after relatively small doses. One patient developed a carcinoma, the only 1 in the 212 in three years. This is of interest in view of the suggestion that androgens may protect patients against carcinoma (Loeser 1938). The histological changes in the breast produced by androgens in doses up to the limit of tolerance are insignificant. The authors believe that the administration of androgens is justifiable at present on experimental grounds alone, and that they should not be prescribed therapeutically until their effects have been studied more carefully.

Diathermy was the method of treatment in 6 patients. Five were temporarily relieved of pain, and 2 of these returned because of the recurrence of symptoms. One patient failed to return for observation. Thus diathermy is of value in alleviating pain in chronic mastitis, but its effect is likely to be only temporary. MANUEL E. LICHTENSTEIN, M.D.

Nánay, A.: Tumors of the Male Breast (Geschwuelste der maennlichen Brust). *Orvosképzés*, 1940, 30: 324.

In the twenty-year material of the Verebely Clinic, Budapest, Hungary, 1,313 tumors of the breast were observed; of these 16 were tumors of the male breast, 5 benign and 11 malignant. No evidence could be obtained which pointed to a traumatic or hereditary origin. The changes were more frequent

in the left breast (63.7 per cent). The benign tumors were included in the group of mixed epithelial tumors. There were four instances of peri-canalicular fibro-adenoma in the patients between the ages of twenty-five and forty years. In 5 patients the condition was localized to the nipple in the guise of benign warts. Even the benign tumors are to be removed in every instance, since they may become malignant. The proportion of malignant tumors of the male breast to those of the female breast is 0.83 per cent; therefore it is somewhat lower than the figures given in the literature (1 to 2 per cent). In 1 case a local recurrence developed at the spot where the tumorous changes had been located according to the anamnesis. The time periods in which the recurrences developed varied from five to fifteen months.

Benign tumors were removed under local anesthesia, while malignant tumors were removed under the usual general narcosis with radical removal of the entire breast gland, of the pectoral muscle, and of the axillary fatty tissues and the lymph glands. Following the operation roentgen irradiation is absolutely necessary. The experiences of the clinic show better end-results in the irradiated cases.

The histological picture varies from that of carcinoma in the female breast. The greatest number of carcinomas in the male are cylinder-epithelial adenocarcinomas. The prognosis is worse in the male than in the female; the explanation for this may be found partly in the indifference of the male toward breast changes, and partly in the anatomical structure of the gland. Of the 6 patients who died, only 2 survived the operation for two years; there was not a single instance of survival lasting from three to five years. (E. Illés). JOHN W. BRENNAN, M.D.

TRACHEA, LUNGS, AND PLEURA

Zavod, W. A.: Bronchospirography. Description of the Catheter and the Technique of Intubation. *J. Thoracic Surg.*, 1940, 10: 27.

The catheter (Fig. 1) used in bronchospirography is made of soft latex rubber, is boilable, 55 cm. long, and slightly opaque in its cross section, which measures 1.0 cm. by 1.2 cm. It has two channels measuring 4 mm. by 5 mm. each in cross section. One channel, the bronchial, extends over the entire length of the catheter; the other channel, the tracheal, is 9 cm. shorter. The bronchial channel has an inflatable rubber bag situated 0.5 cm. from its end; a capillary air lead opens into the bag. A larger bag with its respective capillary air lead is found around the entire catheter 1 cm. above the opening of the tracheal channel. The bronchial and tracheal bags can be inflated to diameters of 2.5 and 5 cm., respectively. The bronchial end of the catheter has 5 cm. of special flexible steel plate incorporated into its wall; this permits angulation of the catheter to correspond to the angle formed at the junction of the left bronchus and the trachea. The capillary air leads and the flexible steel plate are opaque to roentgen rays and are easily visualized under the fluoroscope. The construction of the catheter, as described, permits graphic analysis of the function of each lung separately when the catheter is intubated and connected to recording spirometers.

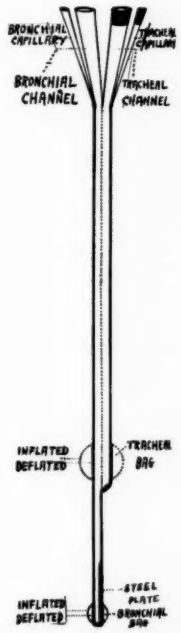


Fig. 1. Structural drawing of the bronchospirometry catheter.

In addition to the bronchospirography catheter, the equipment consists of two monometers, one for each inflatable bag; these measure the amount of pressure necessary to inflate the bags to a given diameter. A 2 per cent solution of nupercaine is used for topical anesthesia of the pharynx, and a 4 per cent solution of cocaine to anesthetize the larynx, trachea, and left bronchus.

The author emphasizes that confidence and cooperation of the patient are most essential so he explains the procedure to the patient before beginning. The patient is seated behind the fluoroscopic screen and the chest is studied. Under visual control with the aid of the laryngeal mirror, the catheter is introduced between the cords, and fed into the trachea for a few centimeters. Patients may become dyspneic; if so, a time is given for readjustment and the procedure is completed under fluoroscopic control.

The most important contraindication is tuberculous ulceration of any part of the larynx, trachea, or bronchi. Intubation should not be done in patients who are extremely dyspneic because of pulmonary or cardiac disease. Patients who have high fever or who are otherwise very ill should not be subjected to intubation. PAUL MERRELL, M.D.

Leiner, G., Pinner, M., and Zavod, W. A.: Bronchospirography. Application to Collapse Therapy; Preliminary Report. *J. Thoracic Surg.*, 1940, 10: 32.

The authors state that more than 70 bronchospirographic examinations were done on about 60 patients. From the data so obtained it is their wish to show: (1) how the disease influences the mechanics of respiration, separately for each lung, and (2) how the various collapse measures alter these mechanisms, with particular reference to the compensatory processes that insure the continuance of normal respiratory function within certain limitations. Five case reports are then given along with the bronchospirographic studies before and after thoracoplasty.

In the 5 cases presented, some of the compensatory mechanisms following collapse therapy have been pointed out. They comprise reduction in the reserve air, decrease of the ventilation equivalent (improvement of the economy of respiration), and increased oxygen consumption by the contralateral lung through increased respiratory labor. Significant increase of the respiratory rate occurred in only 1 patient who had a paralyzed diaphragm.

In only 4 of a total of 29 patients on whom spirographic studies were made before and following some form of treatment, a significant rise in the respiratory rate occurred: in the 1 presented here (thoracoplasty and permanent phrenicectomy), in 1 with pneumoperitoneum, 1 with thoracoplasty, and 1 with pneumothorax complicated by effusions. These observations are suggestive of the important rôle of the diaphragm in ventilation.

In general, it can be said that collapse measures (1) may not necessitate contralateral compensation because they may eliminate only functionally dead space and thereby improve function; (2) may call forth compensation without added work for the contralateral lung, by improving the oxygen consumption through a cardiovascular factor; and (3) may cause increased respiratory labor for the contralateral lung in the form of an increased minute volume, either through an increase of tidal air or of respiratory rate. PAUL MERRELL, M.D.

Janes, E. C., Aitchison, D. B., and Forsberg, A.: Extrapleural Pneumothorax. *J. Thoracic Surg.*, 1940, 10: 8.

The authors have reported their experiences with 77 patients, in whom extrapleural pneumothorax was established. As a result, they state that the indications for this procedure are tuberculous cavities or infiltrations in the upper lung field under the following circumstances:

1. When intrapleural pneumothorax cannot be induced.
2. When intrapleural pneumothorax is incomplete on account of extensive adhesions and when these cannot be severed by closed intrapleural pneumonolysis.
3. When collapse is urgently required to control severe hemoptysis.
4. When there are areas of infiltration without a cavity, which do not respond to bed rest.
5. When there is bilateral disease, long resistant to ordinary treatment, and when thoracoplasty is considered too dangerous.
6. When the patients are very young.

The authors think this procedure offers several advantages over thoracoplasty, namely, a selective limited collapse with less encroachment on the normal lung tissue. It is also a one-stage operation with no resulting deformity.

The contraindications are (1) large peripheral cavities, (2) hopeless extrapulmonary diseases, (3) low vital capacity, (4) dense fibrotic lesions which are unlikely to collapse, and (5) dense adhesions encountered at operation.

The authors believe that their results in these 77 cases have been satisfactory and that this procedure is a useful addition to other methods of collapse therapy. JULIAN A. MOORE, M.D.

Harter, J. S., and Lilienthal, A. A.: Extrapleural Pneumolysis in Artificial Pneumothorax. *J. Thoracic Surg.*, 1940, 10: 14.

The authors report their experience with the use of extrapleural pneumolysis to complete an ineffective intrapleural pneumothorax in 33 patients.

In 20 patients with bilateral disease, with large cavities and extensive disease, and an ineffectual pneumothorax the pneumothorax was completed by this operation. In addition, there were 13 patients who had small soft cavities or infiltrations without cavities and ineffective pneumothorax on whom this operation was done. Many of these 33 patients were very ill.

A satisfactory collapse was obtained in 28 of the 31 living patients. Three patients developed adhesions postoperatively, but their condition was greatly improved. One had a thoracoplasty; one lung re-expanded without reopening of the cavity. The sputum of all but 1 patient is now negative by concentration tests. It is too early to report late results.

As a result of their experience, the authors believe that this method may be used with comparative safety and considerable success in converting an ineffective pneumothorax into a complete pneumothorax in cases in which the adhesions cannot be safely divided by the closed method, and on patients in whom thoracoplasty is contraindicated.

JULIAN A. MOORE, M.D.

Garófalo, D. C., and Boyer, M.: The Treatment of Abscesses of the Lungs (Algunas consideraciones al tratamiento de los abscesos pulmonares). *Semana méd.*, 1940, 47: 685.

The authors review the various methods of medical treatment of abscesses of the lungs and discuss the differences of opinion as to their effectiveness. Some authors claim that only those abscesses are cured that would have recovered spontaneously. It is known that spontaneous recovery does take place in abscess of the lungs.

The authors describe and illustrate with roentgenograms 3 cases of their own treated by the following method: (1) intravenous injection of a 20 per cent solution of alcohol in isotonic glucose solution in increasing doses from 30 to 40 c.cm. per day; (2) slow intravenous injection of a 20 per cent solution of sodium benzoate, in doses increasing daily until the optimum dose is reached (the latter differs in different cases); (3) administration of a solid, salt-free diet; (4) moderate thirst treatment with small amounts of lemonade and orangeade; (5) postural drainage; and (6) administration of heart tonics and diffusible lung stimulants. The authors' results have been very encouraging in the 6 cases treated in this way.

They then discuss endoscopic treatment which is essentially an aspiration treatment. It is very effective in simple hilar or perihilar abscesses. In other cases it generally has only a palliative effect but it may be utilized as a measure preliminary to operation in order to avoid reflux of the pus into the opposite lung.

A new method that is being used to a considerable extent at present is that of short-wave therapy. The waves are applied for from five minutes to a maximum of from fifteen to twenty minutes with a maximum distance between the electrodes of 4 cm. Favorable results obtained by German authors are cited. The good effects are apparently due, not to heat as claimed by American authors, or to a bactericidal effect as claimed by the Germans, but, according to the theory of Pende, to a biological action. The irradiation acts directly on the cells, establishing electronic equilibrium and has an effect resembling that obtained in similar cases by Leriche by sectioning of the sympathetic nerves.

AUDREY G. MORGAN, M.D.

Vívoli, D.: The Anatomicopathological Diagnosis of Bronchopulmonary Cancer (Diagnóstico anátomo-patológico del cáncer bronco-pulmonar). *An. de la cátedra de patol. y clin. de la tuberculosis*, 1940, 2: 32.

On the basis of his extensive experience during the past five years, Vívoli recommends the use of the paraffin inclusion method to study the cancer cells occurring in the sputum and in the sediment of pleural effusions of patients with bronchopulmonary cancer. He found that the diagnosis could be established in from 80 to 85 per cent of the cases by applying the method to the sputum, in 60 per cent of the cases by applying it to the sediment of pleural effusions, and in 60 per cent by applying it to the material obtained by puncture of the tumor. On the other hand, bronchoscopic biopsy makes the diagnosis possible in 75 per cent of the cases, while thoracoscopy is also a valuable aid.

The paraffin inclusion technique for sputum includes the following steps:

The mouth is carefully cleansed, the first sputums of the morning are discarded, and then a good number of sputums are collected in a wide mouthed, 2 or 3 oz. bottle, half filled with 96 degree alcohol, to which 3 or 4 drops of acetic acid may be added. The alcohol is poured off and fixation and dehydration are completed with absolute alcohol; the absolute alcohol is changed three times, being allowed to act for thirty minutes each time, and the sputum is then left in the alcohol for twenty-four hours. The agglutinated sputum is put in a test tube and treated in the same manner as with the absolute alcohol, first with xylol and then with paraffin at 56° or 58° C. To keep the paraffin at the necessary temperature for twenty-four hours, the tube is placed in the incubator at 60 degrees; the paraffin is then allowed to cool and harden, the tube is broken, and the paraffin mold is cut in serial sections having a thickness of 5 or 6 microns. The sections are freed from paraffin, and stained and mounted in the usual manner.

The same technique is used for the treatment of the sediment, obtained by centrifugation of pleural exudate, and of the material collected by puncture of the tumor. Paraffin inclusion gives better results than the usual smears because it prevents deformation of the cells and preserves their relations as in tissue sections.

The author discusses the various etiopathogenic theories of cancer of the lung and the possibility of producing it experimentally by means of substances belonging to the tar group, substances containing an anthracene nucleus and combustion products of petroleum. The incidence of bronchopulmonary cancer is increasing gradually; it occurs much more frequently in men than in women, especially those between the ages of fifty and sixty years, and equally in both lungs. Bronchial cancer is by far the most frequent and is localized most often at the hilus and at the lower third of the main bronchus. Its size depends on the stage of its evolution, its site, and the degree of resistance offered to its growth by the interlobular connective-tissue tracts and the pre-existing bands of sclerosis resulting from previous inflammatory processes. Various anatomicopathological classifications have been proposed.

The author has adopted an anatomicoclinical classification and describes the following forms with examples: original bronchial, hilar, mediastinopulmonary bronchopleuropulmonary (pleural of Roussy and Huguenin), radiating or fanlike, circumscribed nodular (Huguenin), multiple nodular, infiltrative or pneumonic (massive of Letulle), cavernous (primarily cavernous of Letulle), and miliary. Atelectasis, bronchial dilatation, pneumonic or bronchopneumonic processes, abscess, gangrene, and pulmonary perforation are the most frequent complications. Cancerous lymphangitis is found in all cases and the pulmonary veins are usually invaded. Metastasis is usual and appears, in a decreasing order of frequency, in the lymph nodes of the anterior mediastinum, the intertracheobronchial and interbronchial regions, in the supraclavicular lymph nodes, and in the axillary lymph nodes. Metastasis to other organs, such as the liver, kidneys, and suprarenal glands, occurs by way of the circulatory route. Metastasis to the other lung is possible by the respi-

ratory route. The author presents a complete classification of tumors of the lung from the histological point of view and describes each form.

RICHARD KEMEL, M.D.

HEART AND PERICARDIUM

Anderson, R. G.: Non-Penetrating Injuries of the Heart. *Brit. M. J.*, 1940, 2: 307.

Attention is drawn to the frequency of non-penetrating wounds to the heart, many of which pass unrecognized. A review of the literature reveals that until recently only the more severe injuries of this type, involving rupture of the heart, which is nearly always fatal, had been recognized. Animal experiments, in which the heart had been exposed and traumatized by blows, proved that there were many cases not involving rupture of the heart which presented certain clinical findings that are of assistance in the diagnosis of such injuries in man.

Traumatic heart disease may involve the pericardium, the myocardium, and the endocardium. Fibrinous and purulent pericarditis occur in cases of traumatic heart disease, and adherent pericardium, hemopericardium, and Pick's disease with calcifications of the pericardium have been found at autopsy. A blood-stained pericardial effusion was found in half the experimental cases, in which the exposed hearts of dogs were traumatized, as reported by Bright and Beck. Lesions of the myocardium may be either contusions, with softening of the involved tissue and the gradual formation of scar tissue, or actual rupture of the heart muscle. Rupture may involve just a few fibers, or it may present a complete tearing of the heart; it depends largely upon the force of the injury. Contusions may lead to rupture because of the softening of the bruised region; it is most likely to occur in the second week after the injury. Rupture of the valves or of the chordæ tendineæ appears to be very rare. Occasionally subendocardial hemorrhages are found after trauma.

Initial symptoms in patients who survive the immediate effect of trauma to the heart (such as auricular fibrillation or a massive tear of the heart muscle) are transient collapse, usually without loss of consciousness, followed by precordial pain, a sensation of tightness in the chest, dyspnea, palpitation, or faintness. A symptom-free period may follow, in which the patient feels well and is able to exercise normally.

Physical signs include acute dilatation, an increase in the area of cardiac dullness (which may be due to pericardial effusion), the appearance of a thrill or a murmur, especially in cases in which there was none before, weakness of the heart sounds and a characteristic "tick-tick" quality of the sounds, muffling of the heart sounds due to developing effusion, pericardial friction, and abnormalities of rhythm in cases in which these were not present before the injury. A persistent tachycardia with a normal temperature is suggestive. A few days after the injury there may be a temperature rise and a slight leucocytosis.

The electrocardiograph gives fairly constant findings in cases of this sort, the T-waves being most frequently affected. These waves are commonly inverted; they may be unusually large, or typical coronary T-waves may occur. The Q-waves may be abnormally deep, and the QRS complex may be slurred or notched. Various forms of arrhythmias may be found. It is important to be certain that the electrocardiogram was normal before the injury.

The early diagnosis of this condition is important because correct treatment may prevent cardiac rupture. The author recommends six weeks' rest in bed, morphine for the relief of pain, digitalis if signs of congestive heart failure should appear, and quinidine for certain cases of auricular flutter or fibrillation. Paracentesis should be performed for large pericardial effusions.

A case of traumatic heart disease in a man of thirty years, with recovery, is reported in detail.

J. E. TREMAINE, M.D.

ESOPHAGUS AND MEDIASTINUM

Clerf, L. H.: Diseases of the Esophagus; Esophagoscopic Considerations. *Arch. Surg.*, 1940, 41: 1043.

The common symptoms of esophageal disease are dysphagia, odynphagia, regurgitation, loss of weight, and hematemesis. Other symptoms which may be present are hoarseness, dyspnea, and cough, and these are usually due to the spread of a neoplasm to the surrounding structures or to pressure by a large diverticulum. Dysphagia is the most common and often an early symptom, and, even if mild, should focus the attention on the esophagus.

In the study of diseases of the esophagus a complete history and a general physical examination are necessary. The study of the local condition should include a careful inspection of the upper air passages, mouth, pharynx and neck, fluoroscopic study of the chest and the esophagus with the use of opaque mixtures, and finally esophagoscopic examination with a biopsy when indicated.

Congenital anomalies of the esophagus as atresia are usually fatal within a few days of life. The diagnosis is easily made by x-ray examination with a small quantity of barium. Congenital esophageal stenosis, however, and a short esophagus with a thoracic stomach are compatible with life and may go unrecognized for years. In these cases there is usually a very long history of dysphagia.

Acute esophagitis usually follows the swallowing of an irritant or cauterant. As a rule, ulcers and stenosis result. Chronic inflammation may be caused by overindulgence in alcohol or highly seasoned and hot foods. In the acute stage the esophagus should be placed at rest by either a liquid diet or by gastrostomy. Bismuth subnitrate or ethyl-aminobenzoate are useful to relieve the pain.

Benign esophageal ulcer usually occurs at the lower end of the esophagus. Painful swallowing is an

outstanding symptom, the pain occurring usually retrosternally. X-ray and esophagoscopic examinations are diagnostic. Tuberculosis and syphilis of the esophagus sometimes occur, also Vincent's infection and blastomycosis.

Venous varices may occur, usually at the lower end of the esophagus, and can be seen very readily during esophagoscopy. Cicatricial stenosis and compression stenosis can be diagnosed by x-ray study and esophagoscopy. For the former condition, bougienage by mouth or retrograde bougienage through a gastrostomy should be carried out, but always with a swallowed string as a guide.

Pulsion diverticula occur at the level of the cricopharyngeus muscle. They usually cause dysphagia, gurgling in the throat, stale sour breath, and regurgitation of old food. X-ray examination is diagnostic. Traction diverticula occur in the lower portion of the esophagus. They are usually due to inflammation of the surrounding structures and seldom cause symptoms. Cancer of the esophagus may start very insidiously and vague dysphagia may be the only early symptom. Regurgitation, loss of weight, pain, and hematemesis are late symptoms. Thorough investigation by x-ray study and esophagoscopy with biopsy will lead to early diagnosis of cancer of the esophagus. Surgical removal of the growth offers the greatest hope but the procedure is a formidable one.

Foreign bodies in the esophagus should present no difficulties in diagnosis if the condition is kept in mind as a possibility and a thorough study is made.

SAMUEL PERLOW, M.D.

Ochsner, A., and DeBakey, M.: Surgical Considerations of Achalasia; Review of the Literature and Report of 3 Cases. *Arch. Surg.*, 1940, 41: 1146.

A variety of terms have been applied to the clinical syndrome characterized by dilatation and hypertrophy of the esophagus associated with non-organic obstruction of the cardia. These include cardiospasm, achalasia, phrenospasm, idiopathic dilatation of the esophagus, esophagectasia, hiatal esophagismus, mega-esophagus, simple ectasia of the esophagus, preventriculosis, dilatio ingluviformis esophagi, dilatio fusiformis, and dolicho-esophagus. The multifarious designations clearly reveal the controversies regarding the causation and the bewildering pathogenesis of the condition. These are further reflected by the various types of therapeutic procedures which have been employed.

The authors review various theories of the pathogenesis of achalasia, and it becomes obvious that there are considerable diversity of opinion and conflict of views regarding the development of the condition. A great variety of therapeutic measures have therefore been advocated and employed. In general, these procedures may be classified into the conservative and the radical. In this presentation no attempt is made to discuss the former, although it should be realized that they should always be attempted first. It is generally agreed that the radical procedures should be instituted only after the conservative measures have failed.

The various types of radical procedures which have been advocated and employed are classified into four large groups, depending on whether they are directed at (1) the dilated esophagus; (2) the cardia; (3) the diaphragm, or (4) the nerve supply. A brief historical consideration of each procedure is presented. The various operations are described and illustrated, and the collected cases are analyzed.

The procedures directed at the dilated esophagus and based on an attempt to reduce the size of the circumference by esophagoplication are irrational and are considered of historical interest only.

Four types of procedures have been directed at the cardia: (1) dilatation; (2) plastic operation; (3) excision; and (4) deviation.

Dilatation of the cardia has been done by retrograde bougienage and transgastrically by instruments or fingers. Among 80 cases collected from the literature in which the latter procedure was used 7 (8.9 per cent) of the patients died and 8 (10.1 per cent) of the operations were failures.

The plastic procedures consist of extramucous cardiomyotomy or cardioplasty (Fig. 1). Among 104 collected cases in which the former was employed there were 4 deaths and 14 recurrences. Among 36 cases in which the latter was used there were 1 death and 1 recurrence.

Excision of the cardia followed by esophagogastrostomy has been done in 2 cases, in 1 of which the patient recovered. Such a radical procedure, in the authors' opinion, is justified only in the presence of a malignant tumor.

Of the various procedures directed at the cardia, esophagogastrostomy is considered the most rational. This may be performed either by side-to-side anastomosis between the esophagus and the fundus of the stomach or, preferably, by an anastomosis similar to the Finney gastroduodenostomy, which obviates the cardiac spur in the esophagus and thus creates a wider opening between the esophagus and the stomach (Fig. 2). In 88 cases collected from the literature in which esophagogastrostomy was performed there were 5 deaths (6.6 per cent) and only 1 poor result.

Operations directed at the diaphragm consist of phrenotomy and mobilization of the esophagus downward. In 21 collected cases in which these measures were used there were no deaths, and the results were stated as good in 12 (57.1 per cent), and as showing improvement in 3 (14.3 per cent); failures resulted in 6 (28.5 per cent).

The procedures directed at the nerve supply may be classified into those attacking the vagus nerves and those attacking the sympathetic nervous system. Among 11 collected cases in which operations of the former type were done, 3 patients died, 7 recurrences developed, and only 1 satisfactory result was recorded. In 19 collected cases in which operations of the latter type were done there were 1 death due to peritonitis and 1 to suicide. There was a recurrence

in 4 cases, and partial improvement was observed in 4.

Three cases are reported by the authors. An esophagogastrostomy was done in 2, with excellent results. A sympathectomy was performed in the other, with recurrence. SAMUEL H. KLEIN, M.D.

Lanman, T. H.: Congenital Atresia of the Esophagus. A Study of 32 Cases. *Arch. Surg.*, 1940, 41: 1060.

All types of congenital atresia of the esophagus are due to faulty division of the foregut which forms the lung bud and the esophagus. Various types of atresia are found: (1) complete absence of the esophagus, (2) blind ends to upper and lower segments without communication with the trachea, (3a) the upper segment communicating with the trachea and the lower end blind, (3b) the upper segment with a blind end and the lower segment communicating with the trachea (this is the most common type), and (3c) both upper and lower segments communicating with the trachea. Many of these cases are associated with developmental anomalies elsewhere in the body.

In a study of 32 cases, 30 of which were operated on, it was found that 91 per cent had a tracheo-esophageal fistula.

The author recommends a direct attack upon the fistula through an extrapleural approach. If direct anastomosis is possible it should be done. If that is not possible the tracheo-esophageal fistula should be closed, and at a second operation done as soon as possible, an exteriorization of the upper segment and an anterior gastrostomy should be performed.

SAMUEL PERLOW, M.D.

Walters, W., Moersch, H. J., and McKinnon, D. A.: Bleeding Esophageal Varices; an Evaluation of Methods Directed Toward Their Control, Especially by Direct Injection of a Sclerosing Solution. *Arch. Surg.*, 1940, 41: 1101.

Esophageal varices develop as a result of the obstruction of the portal and splenic veins, and bleeding occurs because of their superficial position in relation to the esophageal mucosa. Although Banti's disease and splenic anemia are the conditions most frequently associated with esophageal varices, they cannot be regarded as distinct clinical entities.

The surgical treatment of splenic anemia has been directed toward removal of the enlarged spleen on the assumption that it was contributing toward the destruction of red blood cells, and, in addition, because splenectomy reduces the amount of blood flow to the portal vein by an amount ranging from a normal of approximately 20 per cent to a much larger percentage when the splenic vein and its branches enlarge with the enlargement of the spleen. In addition, in splenectomy the veins communicating between the splenic vein and the cardia of the stomach and esophagus through the short gastric veins and gastrolienal ligament are interrupted by division and ligation, which helps to decrease the amount of venous blood passing through the esophageal varices. After removal of the spleen the denuded surface of the parietal peritoneum forming its previous bed may be the site of formation of collateral veins between the portal and caval systems.

Although the operation of splenectomy for splenic anemia has been followed by good results in a large series of cases, it is apparent that even when combined with ligation of the coronary vein or omentopexy it does not prevent recurrence of bleeding from the esophageal varices in more than 38 per cent of the cases.

Although it has been shown that in portal cirrhosis a considerable flow of blood occurs through the coronary vein (which anastomoses with the internal mammary vein at the cardiac end of the stomach and in the esophagus) and that ligation of this vein in the gastrohepatic omentum will serve to interrupt this flow of blood, this procedure has been used alone in too few cases of splenic anemia to permit any conclusion relative to its merits in reducing the incidence of hemorrhage from esophageal varices in such cases.

The recent successful obliteration of esophageal varices by the injection of sclerosing solutions into them through the esophagoscope and results obtained in the 6 cases reported in this paper, in which the injection was done at the Mayo Clinic, give indications that this is a procedure worthy of trial in order to determine the permanency of its results.

Garlock, J. H.: The Surgical Treatment of Carcinoma of the Esophagus. *Arch. Surg.*, 1940, 41: 1184.

Until recent years the diagnosis of cancer of the esophagus was frequently made late in the disease, too late for surgical treatment, and such a diagnosis was synonymous with a fatal prognosis. The results of radiation therapy for esophageal carcinoma have been universally disappointing. Encouraging progress, however, has been noted in the radical surgical treatment of this disease, if the patients have been referred early, before local or peripheral infiltration and metastasis have taken place. It is important to stress that the physician must regard with suspicion any disturbance in the act of swallowing in a patient past thirty-five or forty years of age, and make every effort to determine whether or not a neoplasm is present. He should include careful roentgen investigation with thick and thin contrast media and esophagoscopy, the latter to obtain a biopsy specimen and to determine the distance of the tumor from the upper incisor teeth. The last-mentioned factor is of importance because it helps the surgeon to decide which type of operation should be undertaken.

It is most important to prepare the patient thoroughly, so that the risk of the operative procedure may be minimized. This should include attention to oral hygiene, a high caloric liquid diet containing the necessary vitamins and minerals, blood transfusions, and parenteral fluids, if necessary. The author also

employs sulfanilamide pre-operatively. A second line of attack against the bacterial flora of the ulcerated neoplasm consists of mechanical cleansing of the esophagus by frequent irrigations of warm boric acid or saline solution through a Levine tube. Preoperative pneumothorax and crushing of the phrenic nerve do not seem to be necessary.

If the neoplasm is located in the upper two-thirds of the esophagus, a gastrostomy will be indicated. The Janeway gastrostomy, or better still, the Spivack valve gastrostomy, has been used preoperatively, but recently the author has changed the plan of procedure. If the patient is in good condition, preliminary gastrostomy is not performed. Instead, during the thoracic part of the esophagectomy, the remaining lower esophagus (carefully covered by a rubber envelope to prevent contamination) is pushed through the diaphragmatic opening into the abdomen, and after completion of the thoracic procedure, this esophageal stump is brought out through a small left rectus incision as an esophagostomy. In this way the sphincter mechanism of the cardia is preserved and no leakage of gastric contents can take place. Another advantage of this new procedure is that the subsequent antethoracic esophagoplasty may be completed in one stage without fear of regurgitation of the gastric secretion, which ordinarily causes digestion of the skin-lined tube.

If the carcinoma is located in the distal third of the esophagus, preliminary gastrostomy should not be carried out, because the presence of a gastrostomy will seriously interfere with the performance of an intrathoracic anastomosis between the stomach and the esophagus, the operation of choice for neoplasms in this situation.

The anesthesia recommended is a combination of avertin and ethylene or cyclopropane. The inhalation anesthetic must be administered with varying degrees of positive pressure during the operation to influence the extent of inflation of the lung. Complete collapse of the lung must not be permitted to take place at any time during the operation.

For purposes of discussing the operative treatment of carcinoma of the esophagus, the organ has been divided into three portions, namely, the upper third, from the hypopharnyx to the level of the arch of the aorta; the middle third, from the latter level to a point about 34 or 36 cm. from the upper incisor teeth; and the lower third, from this level to the cardia.

The methods for removal of carcinoma of the upper third of the esophagus depend upon the location of the tumor (hypopharyngeal, cervical, or supraaortic), its size, and the amount of infiltration into the surrounding structures. The methods include lateral esophagotomy and local excision of the tumor; cervical esophagectomy, with or without laryngectomy; and upper posterior mediastinotomy.

The author employs the Torek operation, which he has modified in some aspects to simplify the steps and shorten the operation, for the removal of carcinomas of the middle third of the esophagus. The operation is described and illustrated in detail in the article and consists essentially of partial resection of the esophagus through a left transpleural approach, and cervical esophagostomy of the upper esophageal stump through a separate cervical incision; if preliminary gastrostomy has not been done, the lower esophageal stump is brought out through a separate abdominal incision as described above.

Postoperatively, at about the end of the second week, the continuity of the esophagus may be restored by a rubber tube placed from the cervical esophagostomy to the abdominal esophageal or gastrostomy opening.

Carcinomas of the lower third of the esophagus, arising from the esophageal mucosa, by virtue of their pathological nature and type of lymphatic spread, are more amenable to radical resection than the adenocarcinomas of the cardia of the stomach. However, the same operation is applicable to cardial carcinomas, if preliminary abdominal exploration indicates operability.

All the evidence to date indicates that transthoracic resection with esophagogastrostomy in one stage is the procedure of choice for carcinoma of the lower part of the esophagus. The operation, a modification of the original Sauerbruch and Fischer operation, consists of a transthoracic approach on the left side, incision of the diaphragm, mobilization of the upper two-thirds of the stomach, resection of the tumor-bearing area, performance of a careful suture anastomosis between the end of the esophagus and the anterior wall of the stomach in two layers and telescoping of the esophagus into the stomach by drawing the latter organ upward in a sleevelike manner around the esophagus in order to minimize any possible drag on the suture line.

The author also describes and illustrates this operation in detail. Small sips of water may be given on the fifth or sixth postoperative day. If nothing appears through the thoracic drainage tube, it is assumed that the suture line has healed and is intact. Increasing amounts of liquid are not given until about the sixteenth day, when custards, jellies, and cereals are permitted. The diet is rapidly increased thereafter. Solid food should not be given until the third or fourth week.

The lumen at the site of anastomosis may diminish in caliber during the succeeding two or three months. If this happens, bougienage through an esophagoscope will become necessary. Such treatment should not be undertaken until there is reasonable assurance that the repair at the site of anastomosis is solid.

Up to the time of writing, the author has operated on 17 patients with carcinoma of the esophagus. Of this group, 6 were found to be inoperable, and 11 were treated by radical resection. The operability percentage was 64.7. In the group of 11 patients subjected to resection, 3 died postoperatively, a mortality of 27.2 per cent. One patient died of a tension pneumothorax on the right side. This death was probably due to an error in judgment and could

have been prevented. The second patient died of a cerebral hemorrhage resulting in hemiplegia seventy-two hours after operation. At autopsy the intrathoracic situation was found to be satisfactory, and the anastomosis between the stomach and the esophagus was intact. There was no evidence of infection. The third patient, a physician of fifty-four, died twelve hours after operation, of shock. The tumor in this instance was firmly attached to the diaphragm and the right pleura. The operation was unusually difficult and consumed almost four hours. Autopsy was not permitted.

In 7 of these cases the modified Torek operation was performed, with 1 death. In the remaining 4, resection with intrathoracic esophagogastrostomy was carried out with 2 deaths. The late results in the patients who survived operation are of considerable importance. Of the 8 survivors, 1 died of a recurrence in the superior mediastinum twenty-three months later; 1 died of coronary disease after three months, and 1 died of generalized metastases one year after operation. The 5 survivors are alive and well three and a half years, eleven months, seven months, six months, and one month, respectively, after operation. In the second and third cases resection with esophagogastrostomy was performed.

In addition to the aforementioned group, the author has operated on 10 additional patients with carcinoma of the cardia secondarily involving the lower part of the esophagus. Three of these were found to be operable, an operability rate of 30 per cent. In these 3 patients transthoracic resection with esophagogastrostomy was performed. There were 2 postoperative deaths. One patient, a woman of seventy-two, in only fair condition, seemed slowly to disintegrate during the following three days. At post-mortem examination the cause of death was not demonstrable. The suture line was intact, and there was no evidence of infection. The second patient died suddenly of a cerebral embolus on the third day. At autopsy the anastomosis was found to be intact, and there was no infection. The third patient is alive and well eight months after operation. The cases comprising this group will form the basis of a subsequent paper. SAMUEL H. KLEIN, M.D.

Textor, H.: Carcinoma of the Esophagus and the Results of Surgical Treatment (Der Speiseroehrenkrebs und die Erfolge der operativen Behandlung). *Giessen:* Dissertation, 1939.

From a study of the patients at the Giessen surgical clinic from the years 1900 to 1939 and a review of the literature the author discusses the following aspects of carcinoma of the esophagus: age and sex incidence, cause, forms, symptoms, diagnosis, localization, metastases, complications, and treatment.

During this period 223 patients with carcinoma of the esophagus were treated in the clinic. One hundred and ninety-three of them were males. There were 46 farmers, 39 laborers, 31 artisans, 19 public officers and employees, 10 professional men, and 12 invalids. Most of these patients were between fifty and seventy years of age. The importance of diagnosis at the earliest possible moment is repeatedly stressed.

The carcinoma was located in the upper third of the esophagus in 8.44 per cent of the patients, in the middle third in 59.74 per cent, and in the lower third in 31.82 per cent. Metastases were present at the time treatment was begun in 10.53 per cent of the patients. The regional lymph nodes were involved in 30 per cent, the liver in 25 per cent, the peritoneum in 20 per cent, the stomach in 10 per cent, and the lungs, thyroid and vertebræ each in 5 per cent of the cases.

The author divides the various types of treatment for this disease into two groups. In the first group he includes medical treatment, dilatation, intubation, electrocoagulation, neurotomy, esophagostomy, gastrostomy, and radium therapy, and in the second group operative removal of the tumor. The methods in the first group, all of which are carefully described, are only palliative measures to partially alleviate the more severe symptoms.

A gastrostomy was made in 172 patients at the clinic with an operative mortality of 15.7 per cent and an average postoperative duration of life of one hundred and forty-six days. The average duration of life among patients who received no treatment after their discharge was one hundred and eighteen days. "If one also considers those who died in the clinic in the study of the postoperative duration of life, a prolongation of life through gastrostomy would beccme scarcely more than words." The average duration of clinical symptoms was five months.

The procedures for operative removal of the tumor may be classified into extrapleural, transpleural, and abdominothoracic types. Six patients were operated upon at the clinic by the last method. Four of these patients died shortly after operation because there were already large areas of infiltration of the carcinoma into the neighboring organs. Two patients recovered. One of the latter was a sixty-year-old woman who was operated upon by A. W. Fischer on January 14, 1936, and the other was a sixty-one-year-old farmer who was operated upon by Bernhard on August 6, 1938. Both were in good health in 1939.

A four-page bibliography completes this industrious work. (SALZER). EDWARD W. GIBBS, M.D.

Heuer, G. J., and Andrus, W. DeW.: Surgery of Mediastinal Tumors. *Am. J. Surg.*, 1940, 50: 143.

The mediastinum harbors an extraordinary variety of benign and malignant tumors. These include the dermoid cysts and teratomas, the cysts of entodermal and mesodermal origin, the cystic lymphangiomas, and the echinococcus cysts. The connective-tissue tumors include fibromas, lipomas, leiomyomas, xanthomas, chondromas, chondromyxomas, and chondrosarcomas. Neurogenic tumors include neurofibromas, ganglioneuromas, neuroblastomas and neuro-epitheliomas, and the benign and malignant

tumors of the thymus gland; the primary tumors of the mediastinal lymph nodes include lymphosarcoma, Hodgkin's disease and endotheliomas, the primary and secondary sarcomas, the rather heterogenous group of primary and metastatic carcinomas, and the intrathoracic goiters.

Occasionally a mediastinal tumor may be asymptomatic and is discovered during the course of a routine physical examination. However, when mediastinal tumors give rise to symptoms these may be of two kinds, general or local. By general symptoms is meant the common symptoms of pain in the chest, cough, dyspnea, and cyanosis. They are the result of mediastinal compression, and vary with the size and location of the lesion and the degree of compression of the various mediastinal structures.

In addition to these general manifestations of mediastinal tumors are other signs which may be designated as local in the sense that they are visible through local swellings or are due to implications of structures in the immediate neighborhood of the lesion. Visible swelling over the chest or in the suprasternal region (in rare instances with pulsation), dilatation of the veins of the neck and front of the chest sometimes associated with edema of the face, inequality of the pupils or a definite Horner's syndrome, hoarseness due to pressure upon the recurrent laryngeal nerve, dysphagia due to pressure upon or dislocation of the esophagus, herpes or neuralgia due to pressure upon the intercostal nerves—all are manifestations of mediastinal tumors, which are observed with variable frequency, and some at times have a definite localizing value. The occurrence of Horner's syndrome, for example, suggests not only a lesion of the posterior mediastinum but one involving the paravertebral sympathetic chain.

The symptoms just enumerated are due largely to mechanical causes, and not infrequently death in mediastinal tumors is due to mediastinal compression and its effects upon the respiration and circulation. In malignant lesions anemia, loss of weight and strength, and irregular fever occur as in other malignant tumors but are seen less frequently, perhaps because of earlier death from the compression. It should be recognized that tumors of the mediastinum may cause symptoms referable to the spinal cord, and, conversely, tumors arising within the spinal cord may extend into the mediastinum.

In the diagnosis and differential diagnosis of mediastinal tumors, all the resources of the internist, roentgenologist, bronchoscopist, and surgeon may be necessary. Careful physical, roentgenographic, bronchoscopic, and sputum examinations will serve in some cases to establish not only the presence and location of the lesion but also its pathological nature. In some cases, especially those in which the tumor is near the thoracic wall, an aspiration biopsy may serve to establish the pathological diagnosis; in others, the removal of an accessible involved gland, or the response of a lesion to a controlled dose of roentgenotherapy may be of diagnostic value. However, experience shows that in not a few cases all our present diagnostic methods fail to establish the pathological nature of the tumor, although they do establish its presence and its location within the mediastinum.

Usually, in the authors' experience, a clearly defined, circumscribed shadow in an x-ray film is most often cast by a benign tumor, although this does not rule out such lesions as ganglioneuromas or teratomas which have undergone malignant degeneration, certain sarcomas, or lesions other than tumor, as mediastinal abscess and non-pulsating aneurysms. Again, the diffuse, poorly defined, irregular shadow is most often associated with malignant conditions, a finding to which also there may be exceptions. Less important than the roentgenogram is the diagnostic information obtained from the particular location of the lesion. Tumors in the posterior mediastinum are particularly apt to be the ganglioneuromas or other neurogenic neoplasms arising from the sympathetic chain or thoracic nerves, or the various forms of chondroma arising from the costovertebral articulation or intervertebral discs. The dermoid cysts almost always occur in the anterior mediastinum. Frequently, however, such distinctions have no meaning, for when the tumors reach any considerable size they may defeat all efforts to determine their exact site of origin. It must be admitted, when all is said, that one of the handicaps to more intelligent treatment of mediastinal tumors lies in our diagnostic limitations.

In the treatment of mediastinal tumors the question of surgical removal or roentgenotherapy naturally arises. From the authors' observations there would appear to be a tendency on the part of the profession to treat mediastinal tumors primarily by radiation. The opinion seems to be prevalent that x-ray therapy may achieve satisfactory results, and if it fails to do so, surgery may then be considered. The authors would suggest that this attitude be reversed; that upon the discovery of a mediastinal tumor the surgeon, experienced in thoracic surgery, should be consulted; and not until he has concluded that surgery is inadvisable should x-ray therapy be undertaken. Certain benign tumors and some of the malignant tumors are amenable to surgical removal and in general these fail entirely to respond to x-ray therapy. Not only does x-ray therapy fail to reduce their size but it may fail also to prevent their malignant degeneration. It may make subsequent attempts at surgical removal more difficult and hazardous because of the production of massive adhesions. It may be not only a wasted effort but one productive of harm to the patient.

The authors have found that intratracheal anesthesia is the most satisfactory for operation upon mediastinal tumors, and they especially recommend the use of cyclopropane gas.

Generally speaking, the mediastinal tumors may be exposed by one of three operative approaches, namely, the anterior, lateral, or posterior. The anterior approach is applicable to tumors of small and medium size situated in the anterior mediastinum.

The lateral approach is used in cases of the large mediastinal tumors which have extended laterally into one or the other pleural cavity. The posterior approach is satisfactory for the tumors which occupy the upper posterior mediastinum. The operative technique for each of these methods is described.

The various types of tumors of the mediastinum are taken up in detail, and their pathology, symptomatology, diagnosis, and treatment are described. Illustrative case reports are given also.

The article includes a large bibliography. The latter is classified under the headings of the various types of mediastinal tumors enumerated.

SAMUEL H. KLEIN, M.D.

MISCELLANEOUS

Lambert, A. V. S.: The Etiology of Thin-Walled Thoracic Cysts. *J. Thoracic Surg.*, 1940, 10: 1.

Lambert has reported 2 cases of thin-walled cysts occurring within the thorax, which were successfully removed by Berry. He reports another operated on by Butler and calls attention to one operated on by Pickhart. These were called endothelial cysts of the mediastinum.

These cysts are easily distinguished from echinococcus cysts, dermoid cysts, and teratomas by examination of their walls. They are not easily distinguished from lymphangiomas, as it is impossible to tell the difference between mesothelium and endothelium, microscopically. However, lymphangiomas are multilocular and are composed of a conglomerate mass of individual cavities which vary greatly in size. In addition, lymphangiomas are intimately incorporated with the various structures amid which they are situated. There is no sharp line of cleavage; they cannot be shelled out and attempts at removal have been accompanied by profuse bleeding.

Lambert traces the embryological development of the pericardium and holds that in all probability these reported cysts are due to the fact that one of the primitive lacunæ failed to merge with the others, persisted, and developed into an independent cavity forming a cyst. These cysts should be called pericardial celomic cysts. JULIAN A. MOORE, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Shalagin, M. A.: The Defensive Rôle of the Peritoneum and Omentum in the Fight Against Bacteria; the Rôle of Trauma in the Development of Peritonitis. *Vestnik khir.*, 1940, 59: 610.

In order to test the defensive power of the peritoneum and omentum against infection and to study the rôle of trauma of the abdominal muscles in the development of peritonitis, the author conducted 2 series of experiments. In the first series he introduced into the peritoneal cavity of rabbits and dogs various numbers of hemolytic streptococci and colon bacilli; in the second series he carried out the same procedure and, in addition, traumatized the abdominal muscles. The virulence of the microörganisms was determined on white mice. A suspension of bacteria was introduced into the abdominal cavity through a midline incision under strict aseptic conditions, and the peritoneum was closed without drainage. After the animals died or were killed, cultures were made from the peritoneal exudate parenchymatous organs, and blood was obtained from the blood vessels and heart.

Dogs were found to be very resistant to an intraperitoneal infection with hemolytic streptococci. They succumbed to a dose of two billions of bacteria or more per kilogram of body weight. The introduction of large numbers of hemolytic streptococci or of colon bacilli produced a fatal peritonitis without any evidence of a previous trauma involving the peritoneum.

In the second series of experiments the abdominal cavity was opened through a midline incision, the intestinal loops were pushed to one side, a 5 by 6 cm. section of the posterior parietal peritoneum overlying the quadratus lumborum muscle was excised, and the muscle was crushed with strong hemostats and smeared with a suspension of microörganisms. The incision was closed without drains. A fatal acute septicemia developed under such circumstances after the introduction of a number of microörganisms from 20 to 30 times smaller than that necessary for the production of fatal peritonitis without muscular trauma.

Apparently the virulence of bacteria and the presence of local and general favorable conditions are more important for the development of pathogenic microörganisms than their number.

Cultures from the internal organs of animals which succumbed to an intraperitoneal infection with hemolytic streptococci or colon bacilli showed a growth of the corresponding bacteria. In animals which recovered from the infection, all tissues and organs were found to be sterile after ten days.

A grave course of peritoneal septicemia in animals with traumatized muscles may be ascribed not only to the presence of dead tissues serving as a nutrient medium, but also to the development of toxic products in deteriorated muscle tissues.

JOSEPH K. NARAT, M.D.

Shelley, H. J.: Direct Inguinal Hernias; A Study of 605 Hernias and of 565 Repairs. *Arch. Surg.*, 1940, 41: 857.

The author points out that division of inguinal hernias into indirect and direct types as a clearcut grouping is not possible. In considering the etiological factors it was found that the average age at which direct inguinal hernias were first noted was ten years later in life than the corresponding age for incomplete indirect inguinal hernias. While a small percentage of these hernias was noted from the twentieth to the twenty-fifth year of life, most of the hernias were first noted in the period between the ages of twenty-five and fifty-five years with the highest incidence in the fifth decade of life. The average age (43.7 years) at the time of admission or operation was nine years later in life than that of patients with incomplete indirect inguinal hernias (34.8 years).

As to sex incidence, the great majority (96.9 per cent) of these hernias occurred in males. This percentage amounted to 88.7 in the cases of incomplete indirect inguinal hernias. Only 3.1 per cent of the direct hernias were found in females, which is about one-fourth of the incidence of incomplete indirect inguinal hernias in females.

The recurrence rate for direct hernias in males was double that for males after repairs of incomplete indirect inguinal hernias (15.2 and 7.5 per cent, respectively), while for females these figures were nearly the same.

A history of definite trauma as the etiological factor was given in a slightly greater proportion of cases among the direct inguinal hernias than among the incomplete indirect inguinal hernias. Also, a slightly greater percentage of patients gave a history of pain associated with direct inguinal hernias than with incomplete indirect inguinal hernias.

In the direct inguinal hernias fewer of the sacs extended into the scrotum than was found to be the case in the incomplete indirect inguinal hernias. The percentage of hernias which extended beyond the external ring, or were limited to the inguinal canal, was slightly more than one-third greater among the direct hernias. Repairs of direct inguinal hernias were followed by greater increases in the percentage of recurrence when the sacs were long than when the sacs were limited to the inguinal canal.

It was found that a smaller percentage of incarcerations occurred among the direct hernias than among the indirect hernias, although the percentages of strangulated hernias were practically the same in the two types.

The incidences of location (right or left) of direct and of incomplete indirect inguinal hernias were

the same. Nearly twice as great a proportion of direct inguinal hernias as of incomplete indirect inguinal hernias was bilateral, i.e., the hernias were associated with an inguinal hernia of some type on the opposite side.

As to operative technique, it was found that repair of direct inguinal hernias, and also of incomplete indirect inguinal hernias, by catgut suture of the rectus muscle or of the anterior sheath of the rectus muscle, to the inguinal ligament is an unsatisfactory procedure. Even after elimination of the aforementioned type of repair from all operations in which catgut sutures only were used, a greater incidence of recurrence was found than that which followed the use of fascial sutures. This was true notwithstanding the fact that a greater percentage of the more difficult repairs was included in the fascial suture group.

Shelley's operative technique is as follows:

The conjoined tendon is sutured to the inguinal ligament with a fascial suture obtained from the aponeurosis of the external oblique muscle, after the technique of McArthur. Transplantation of the cord superficial to the aponeurosis of the external oblique muscle is not good as it invites more complications whether catgut or fascial suture is used.

Approximation of the cut edges of the external oblique aponeurosis will be facilitated by placing the first suture at the medial end of the incision to form the external ring and drawing the cord downward, so that it lies in a straight line in the inguinal canal before this first suture is tied.

It is the author's opinion that conversion of the direct sac into an indirect one in the dissection of these hernias is a distinct improvement over isolation of the sac through the transversalis fascia at the point where it extends into the inguinal canal.

The percentage of postoperative complications was twice as great after repairs of direct hernias as after repairs of incomplete indirect inguinal hernias.

The proportion of recurrences following repair of direct inguinal hernia was the same as that following repair of indirect inguinal recurrences and 50 per cent greater than that following repair of incomplete indirect inguinal hernias.

From Shelley's report it would seem that the use of a fascial suture is decidedly worth while.

MATHIAS J. SEIFERT, M.D.

Joyce, T. M.: Fascial Repair of Inguinal Hernias. *J. Am. M. Ass.*, 1940, 115: 971.

The author briefly reviews the evolution of the treatment of inguinal hernia from early times. He believes that the use of fascia, particularly in the form of sutures, contributes in a large measure toward the reduction of recurrences, and contends that if fascia is desirable in the repair of difficult hernias it is also desirable in the repair of hernias that are not difficult. In his own practice he repairs all types of hernias with fascial sutures.

His technique modifies and combines Halsted's transplantation of the cord, Andrew's imbrication of the external oblique aponeurosis, and McArthur's or Gallie's fascial sutures. He emphasizes the importance of suturing fascia only to fascia. In his repair, a strip of fascia about ¼ in. wide is cut from the edge of the superior flap of the external oblique and left attached at the pubic spine. Threaded on a needle of smaller caliber than the Gallie needle, this fascial strip approximates the superior edge of the external oblique to the shelving portion of Poupart's ligament. The end of this strip is anchored with silk or chromic catgut. When the superior flap of the external oblique lacks sufficient fascia, and in the repair of recurrent hernias, fascia is obtained from the thigh.

For the five-year period terminating January, 1939, the author reports a total of 760 operations, of which 544 could be traced. Some of these were performed by the author and other experienced surgeons, and some by resident surgeons and externs. There were 16 recurrences, a percentage of 2.94, for all the traced operations. The recurrence rate for 3 experienced individual surgeons was less than 1 per cent; for a group of 12 staff surgeons, 3.92 per cent; and for a group of 12 externs and resident surgeons, 6.66 per cent.

There were 5 (0.74 per cent) postoperative deaths and 8 wound infections. In 2 instances infection was followed by recurrence. No testicular atrophy was observed in the series. The type of anesthesia appeared to be of no consequence.

JOHN L. LINDQUIST, M.D.

Feinblat, B.: The Surgical Management of Femoral Hernias and Its Late Results (Die operative Behandlung der Schenkelbrueche und ihre Spaetergebnisse). *Chirurgija*, 1940, No. 2/3, p. 100.

The evaluation of a group of 277 cases selected from the literature reveals that femoral hernia occurs primarily in women (5:1) and in the later years of life (238 patients were over forty years of age). Childbearing and strenuous physical work favor its development. The right side is more frequently affected (170 times) than the left (98 times), and bilateral involvement is rare. Strangulation of the contents occurs more frequently in femoral than in inguinal hernia; an analysis of this series showing 155 (56 per cent) to be strangulated, 74 (26.7 per cent) irreducible, and only 48 (17.3 per cent) reducible. By comparison with statistics of the "Time before the Revolution," it is evident that strangulation is now correctly diagnosed and brought to operation much earlier than formerly. Operation was done on 70.3 per cent of the patients within the first twenty-four hours and on 45.8 per cent within the first twelve hours after the onset of symptoms.

Operation was performed on 269 patients, for the most part (93 per cent) under local anesthesia and by the "simple" method of herniotomy (88 per cent). By this means the carefully isolated hernial sac was ligated as high as possible, after replacement of its contents, and the stump was buried in the abdominal cavity. The hernial ring was closed by

means of three or four sutures between Poupart's ligament and the pectineal fascia. It was necessary to resect intestines eleven times and omentum thirty-six times. Wound suppuration (29 cases) was observed following operation twice as often in strangulated hernias (20) as in "free" hernias. The type of hernia not only influences wound healing but it affects the incidence of recurrence. One hundred and thirty-five patients could be traced from one to ten years after operation and among them were 15 recurrences (11.1 per cent); of these 2 were scarcely avoidable because of technical difficulties at the time of operation (extensive intestinal resection and tamponade having been necessary). The remaining 13 recurrences were found among the 127 cases which had been operated upon by the "simple method." There were 3 deaths, all of patients with incarcerated femoral hernias which were reduced. One death was due to peritonitis; it occurred in a patient operated upon two days after strangulation; 2 deaths were due to circulatory failure. Both of these patients were operated upon on the sixth day after hernial strangulation and both were well over sixty years of age.

In conclusion, the operation of Ruggi-Parlavecchio for femoral hernia is subjected to a critical discussion and is rejected as the procedure of choice. This operation was performed in 14 cases and 8 of the patients were traced and found without recurrence; however, 1 patient had developed a large inguinal hernia. The author believes that such a technically difficult procedure should be restricted to the exceptional case. (Schober). John L. Lindquist, M.D.

Shelley, H. J.: Femoral Hernias. A Study of 238 Hernias and 226 Repairs. *Arch. Surg.*, 1940, 41: 1229.

Included in this study were 238 femoral hernias. They comprised 5.35 per cent of the total group of all types of hernias seen in the wards in the period covered by this study. Among these, femoral hernias not previously repaired numbered 222, and 210 of these were repaired by operation. One hundred and forty were examined postoperatively for nine months or longer or until a recurrence was discovered. Only 5 recurrences developed, which gave a recurrence rate of 3.6 per cent.

The remaining 16 femoral hernias were recurrent, following a previous repair. All 16 were operated on. Thirteen were followed up for nine months or longer; 2 recurrences were discovered, a recurrence rate of 15.4 per cent.

The period covered by this study was from 1916 to 1935, inclusive. All femoral hernias in patients admitted to the wards at St. Luke's Hospital, New York, from 1926 to 1935, and all hernias of this type repaired in the ten-year period from 1916 to 1925 in patients who returned for follow-up examinations over periods of nine months or longer, or until a recurrence was discovered, were included.

The operative mortality was 4.9 per cent (as compared to 0.52 per cent in incomplete indirect inguinal hernias) and was due to 7 deaths, all following repairs of strangulated hernias. One death followed the repair of 16 recurrent femoral hernias, a mortality rate of 6.3 per cent.

Primary hernias. Of the 222 femoral hernias studied, 12 were not repaired. There were 7 operative deaths, and 34 patients did not return for follow-up examination. One hundred and forty were followed up for nine months or longer, for an average period of twenty-four and nine-tenths months. Only 5 recurrences were discovered, an incidence of 3.6 per cent. The average postoperative time at which the recurrences were first noted was twenty-six and eight-tenths months.

A total of 170 patients were examined in the follow-up clinic. The average follow-up time for all was twenty-one and two-tenths months. The recurrence rate calculated on all follow-up examinations was 2.9 per cent.

Recurrent hernias. All of the 16 patients with recurrent femoral hernias were operated on. One died postoperatively. Thirteen of the remaining 15 were followed up for nine months or longer. The average follow-up period was thirty-three and two-tenths months. Two recurrences were discovered, which gave a recurrence rate of 15.4 per cent. The average postoperative time at which these recurrences were discovered was ten months.

Fourteen patients altogether were examined in the follow-up clinic. The average follow-up time was thirty and one-tenth months and the recurrence rate was 14.3 per cent.

The author also discusses the operative technique of femoral hernioplasty. He states that with careful, intelligent surgical handling, satisfactory results will ensue whatever the method of repair. The use of silk throughout for suture and ligature material is recommended as a distinct improvement over the use of catgut.

Patients in whom a recurrent femoral hernia has been repaired should be kept in bed longer than those with primary repair. The additional time is to be determined by the nature of the repair required in each individual case. Samuel H. Klein, M.D.

GASTRO-INTESTINAL TRACT

Ruffin, J. M., and Brown, I. W., Jr.: The Effect of Inflation of the Stomach Upon the Gastroscopic Picture. *Am. J. Digest. Dis.*, 1940, 7: 418.

A critical analysis of 543 gastroscopic examinations done at Duke Hospital revealed that hypertrophic folds, or a cobblestone mucosa, was seen in only 3.9 per cent of the cases, as contrasted to Schindler's report of hypertrophic gastritis in 17.2 per cent of the cases studied by him. This discrepancy could not be explained by the essayists until about a year ago when they found that the large folds interpreted as hypertrophic gastritis would become normal or even completely defaced by inflation. It was noted that in every case the large and apparently swollen folds became normal

or flattened merely by inflation with air; that normal folds tended to disappear and in a few cases blood vessels were to be seen where an apparently normal mucosa had been observed previously. These findings are beautifully illustrated in the original article by excellent, colored drawings and substantiate the authors' reports on findings.

An experimental study upon the alteration of the gastric mucosa by inflation was then done both in dogs and in man. In the dog it was found that the normal folds could be effaced at an average pressure of 14 cm. of water and at this pressure the picture was "indistinguishable from that which had been described as being characteristic of atrophic gastritis." In man it was found that the folds were effaced at an average pressure of 21 cm. of water. There is no doubt that folds which seem large, swollen, and inflamed when the instrument is first introduced may appear entirely normal after slight inflation and can usually but not always be obliterated completely by further inflation.

In some patients, folds which appeared normal have disappeared under inflation and a typical picture of atrophic gastritis with visible blood vessels has presented itself. All this raises the question whether the folds are actually smaller or whether the change in the picture is due to the greater distance of the instrument from the objective and therefore to difference in magnification. This question is difficult to answer because when the stomach is inflated the mucosa is presumably much further away from the instrument with a resulting smaller image.

The authors believe that hypertrophic gastritis is, at least in North Carolina, rarely seen. They also wish to change our concept on atrophic gastritis. They state that it should be described as an atrophy of the gastric mucosa. It is possible that an apparent atrophy is due to lack of tone in the gastric musculature and the restoration of tone results in a normal gastroscopic picture. Their final conclusion is that the diagnosis of chronic gastritis by means of the gastroscopic picture should be the subject of further investigation and critical study.

SAMUEL J. FOGELSON, M.D.

Sebastianelli, A., and Gigante, D.: Microscopic Examination of the Gastric Juice in the Secretory Changes and in Some Affections of the Stomach (L'esame microscopico del succo gastrico nelle alterazioni secretive e in alcune malattie dello stomaco). *Minerva med.*, 1940, 31: 293.

After reporting the results obtained by different authors in the microscopic examination of the gastric sediment, Sebastianelli and Gigante try to establish whether this procedure may offer some clues in the diagnosis of gastric affections and whether some affections show a characteristic microscopic picture. Further, the authors deal with the morphology and significance of the elements usually found in the sediment: cells, bacterial flora, amorphous detritus, and mucus.

With regard to the degree of acidity of the gastric juice the patients (about 100) were divided into four groups: (1) those with normal acidity; (2) those with achlorhydria; (3) those with hypo-acidity; and (4) those with hyperacidity.

1. In the first group were 14 subjects showing, after histamine stimulation, free hydrochloric acid from 40 to 50 and a total acidity from 60 to 70. In the sediment a few epithelial cells, some bacteria, and rare leucocytes were observed. In some cells the nucleus and protoplasm were perfectly normal; twice as many, however, showed degenerative changes. In only 3 cases a low, moderate, or large number of leucocytes was found. Normal acidity does not mean a normal mucous membrane; in many inflammatory, ulcerous, and neoplastic affections the amount of hydrochloric acid in the gastric juice may be normal.

2. In all cases of this group the cells were unchanged. The number of bacteria and leucocytes was not always increased: this could be due to the fact that in some cases this affection is of a purely functional order. In 9 of 16 of the authors' cases many bacteria of different kinds and only a few leucocytes were found. A helpful indication for the microscopic diagnosis of achylia is the perfect integrity of the nucleus and protoplasm of the cells.

3. The features of the cells in these cases varied extremely according to the degree of hypo-acidity. In some cases they appeared to be like those in normal conditions (15 of 40), in others like those observed in anachlorhydric patients.

4. In this group (18 cases) there were two constant signs: the presence of much amorphous detritus and considerable degenerative changes in the epithelial cells. The protoplasm could hardly be recognized and the nucleus was deeply affected. The number of bacteria and leucocytes was in some cases increased, in others diminished. The degree of acidity is therefore not the only factor in gastric microbic sterility.

From the results reported in the literature and from observations of their own, the authors draw some conclusions. It seems that the microscopic picture of the sediment may be helpful for the understanding of the type of the gastric-acid secretion. Achlorhydria may be diagnosed when the cells are normal and the bacterial flora abundant. When the cells are reduced to the nucleus, which often is degenerated, and there is little flora, excessive acidity is present. The number of leucocytes does not give any indication of the degree of acidity, but it is a safe criterion for the diagnosis of gastritis.

The initial stage of gastritic atrophy shows generally, according to the authors, a rich bacterial flora and a small number of leucocytes. In ulcerous processes a rich bacterial flora and a large number of leucocytes are usually but not always observed: red blood cells are constantly present but are not characteristic of these conditions alone. Neoplastic cells were rarely found. Eosinophile leucocytes are only exceptional.

NELDA CASSUTO.

Carter, B. N., Stevenson, J., and Abbott, O. A.: Transpleural Esophagogastrostomy for Carcinoma of the Esophagus and for Carcinoma of the Cardiac Portion of the Stomach. *Surgery*, 1940, 8: 587.

In the instances in which it can be accomplished, the resection of the lower end of the esophagus, of a portion of the cardiac end of the stomach, or of portions of both followed by esophagogastrostomy offers the most satisfactory method of dealing with carcinoma in these areas. By this procedure the growth can be extirpated and the continuity of the stomach and esophagus restored in one stage, and thus the necessity for the formation of antethoracic skin tubes or for the use of rubber tubes to allow the act of swallowing to be completed is avoided. This operation should have a wide field of usefulness in view of the fact that from 33 to 50 per cent of all carcinomas of the esophagus are said to occur in the lower third of this organ and about 10 per cent of all those in the stomach occur at the cardia.

The approach to lesions in the cardiac end of the stomach and in the lower end of the esophagus is easier when carried out through the chest than when attempted through the abdomen. After a preliminary artificial pneumothorax has been induced, the thorax can be safely opened through an intercostal incision in the seventh or eighth interspace and an excellent exposure of the terminal third of the esophagus and diaphragm can be obtained. When the diaphragm has been widely opened from the esophageal hiatus to the costal margin, an easy access is afforded to the entire stomach, spleen, and a portion of the liver. The stomach can be readily mobilized, as can the lower half of the esophagus, and, after portions of them have been resected, the anastomosis can be completed under direct vision without the need of working down in a small, dark wound. If the wound edges are protected, and the pleural cavity is packed off with sponges, there is little danger of empyema due to soiling of the pleural cavity. Empyema follows leakage at the line of anastomosis rather than soiling at the time of operation.

The majority of the failures of the methods which have been used in the past have been due to two causes: viz., shock and leakage at the suture line. With the improved technique of operating, with better methods of anesthesia, with the recognition of the importance of pre-operative pneumothorax, and with the increased use of blood transfusions, the danger from shock has practically disappeared and can now be placed at a minimum. The most potent cause for leakage at the suture line has been tension on the line of anastomosis. The authors have attempted to obviate tension in two ways: first, by anchoring the stomach to the periosteum of a nearby rib in such a way as to remove any pull or drag on the point of anastomosis; and, second, by stitching the diaphragm well down on the stomach, rather than close to the line of suture between the stomach and the esophagus. Recently in some experimental work the authors have anchored both the stomach and the esophagus to the chest wall (periosteum of the rib or of a vertebral body) so that the line of anastomosis between the stomach and the esophagus can actually be displaced from side to side and from above down without the least pull on it. They believe that this is a most important point in the technique and that by utilizing it one can completely avoid tension. The rent in the diaphragm through which the stomach has been brought into the thorax must be partially closed and the edges of the diaphragm then sutured to the stomach in order to prevent herniation of the intestine through the diaphragm. When the diaphragm is sewed to the stomach, care must be taken to attach it well down toward the greater curvature so as to place plenty of stomach in the thorax. The tendency is to stitch it too close to the anastomosis and thus create a drag on it.

Fig. 1. The growth in the esophagus has been resected along with a portion of the stomach. The stomach has been closed. The solid line on the stomach shows the line of the incision in the fundus through which the end of the esophagus was introduced. The end of the esophagus has been closed with a purse-string suture of No. 00 catgut, the ends of which were left long and used to pull the esophageal stump well down into the stomach, while the latter was sutured around the esophagus. The insert shows the completed anastomosis. Note the sutures which attach the stomach to the periosteum of the seventh rib.

In the 2 cases reported by the authors in this paper, the stomach was securely anchored to the periosteum of a nearby rib, after the anastomosis had been finished, with four sutures of silk (Fig. 1). The end-to-side anastomoses between the stomach and esophagus were not done aseptically, but, since there was no leakage at the suture line, the pleura was able to cope with the small amount of soiling and no empyema resulted in either case. In both in-

stances the wound in the chest wall healed per primam. Gastrostomy had been done in each instance weeks or months before the actual anastomosis between the stomach and esophagus was performed. In spite of this the stomach could be mobilized well enough to allow a sufficient portion of it to be pulled up into the chest to reach the esophagus without tension.

One patient who was operated upon in May, 1939, is alive and apparently well. The other patient died ten months after operation and, though no cause could be found at autopsy for her death, it must have been related to a stricture at the site of anastomosis which developed after operation.

The type of esophagogastrostomy in which the end of the esophagus is introduced into the stomach through a slit in the latter was used in both cases herewith reported, but it is not to be recommended. Stricture followed in each of the 2 cases in which this type of anastomosis was performed.

The use of continuous suction in the esophagus after esophagogastrostomy is of advantage in relieving pressure on the suture line by removing the accumulated secretions and by keeping esophageal peristalsis at a minimum. JOSEPH K. NARAT, M.D.

Macleod, J. G., and Baird, R. B.: Carcinoma of the Stomach in Young Subjects. *Edinburgh M. J.*, 1940, 47: 627.

Three cases of carcinoma of the stomach occurring in persons thirty years of age or under were recently admitted to the wards of the Royal Infirmary, Edinburgh. During the period from January, 1934, to January, 1940, approximately 700 cases of gastric cancer were treated in the same institution. Among this number, 7 more instances of cancer of the stomach in persons of thirty years of age or under were observed, which made a total of 10 cases in all.

Bruckner, in 1936, discussing carcinoma of the stomach in young people, found that males tended to be affected twice as frequently as females. The tumors were usually medullary, less commonly scirrhous, and the pyloric antrum was the usual site. Phillip's analysis (1939), based on a series of 96 cases of stomach cancer in persons of thirty years of age or under, which were observed at the Mayo Clinic, was made over a period of thirty years. Ninety of the patients had carcinoma. The lesion involved the lesser curvature in 26 instances, the pyloric antrum in 24, the entire stomach in 19, the pylorus in 9, the greater curvature in 8, the cardioesophageal region in 6, and the middle third of the stomach in 4.

Bruckner stated that the disease most commonly simulated peptic ulcer. The illness was characterized by a sudden onset, a rapid course, persistent fever, and progressive anemia. Free hydrochloric acid was commonly present, but an abdominal mass was infrequently felt. The outlook was hopeless, no patient having lived longer than three years.

The authors' series, admittedly small, differs from the series described in the following features. Six of the 10 cases occurred in women. Histological confirmation, obtained in 6 instances, showed 4 adenocarcinomas, 1 case of scirrhous, and 1 of medullary carcinoma. The pyloric antrum was involved in 8 cases, the lesser curvature in 1 case, and the entire stomach in 1 case. The characteristic course in 7 cases began with a period of vague dyspepsia in which abdominal pain was a common feature. Vomiting was present in 9 cases and tended to be obstructive in type. Pyrexia was uncommon; it was present in only 1 instance. A mass, far from being infrequent, was palpable in 7 patients.

The average duration of symptoms prior to admission was fifteen and one-half weeks. Local metastases were present in 9 patients. In 3 of the 6 cases examined post-mortem, metastases were widely disseminated. The outcome was uniformly fatal.

Special emphasis should be laid upon the short course of the disease, the extensive metastases, and the hopeless prognosis in young individuals with carcinoma of the stomach. The condition, while uncommon, is not as rare as it is usually thought to be. Therefore the error of ruling out the diagnosis of stomach cancer on account of the youth of the patient who is suffering from an anomalous type of dyspepsia, must be avoided. In such cases the routine use of the flexible gastroscope in hospital practice might enable a diagnosis to be made sufficiently early for the more fruitful exploitation of radical surgery. JOHN W. NUZUM, M.D.

Eusterman, G. B.: Small Carcinomatous Gastric Lesions Simulating Chronic Benign Ulcer; Present Status of Differential Diagnosis and Treatment. *Minnesota Med.*, 1940, 23: 703.

Carcinoma in its earlier stages is still diagnosed too infrequently. Circumscribed innocent-looking ulcerous gastric lesions may be actually or potentially malignant. Satisfactory differential diagnosis, in the absence of a specific biological test for carcinoma, is frequently impossible without recourse to microscopic examination of the lesion. On the basis of repeated clinical and pathological observations, certain diagnostic criteria of relative or absolute value in differential diagnosis have been evolved.

The typical benign ulcer is small, usually not exceeding 2.5 cm. in diameter, and has certain familiar roentgenological characteristics. When the patient is thirty years of age or less, a small ulcerous lesion associated with 40 units of free hydrochloric acid in the gastric contents after the Ewald meal is usually benign. A concentration of free hydrochloric acid of 60 or more clinical units (Ewald) also strongly favors benignancy. The benign nature of the lesion is also characterized by the permanent disappearance of all symptoms and signs following adequate medical treatment, irrespective of age, nature or duration of symptoms, or size or location of the lesion.

Although about a fifth of all malignant gastric lesions may be within the size range of benign ulcer (4 cm. or less in diameter) only 6.5 per cent of carci-

nomas are small ones (2.5 cm. or less). At least 5 per cent of the lesions unequivocally diagnosed in recent years by our roentgenologists as benign ulcers were actually carcinomatous. The meniscus complex for all practical considerations is pathognomonic of ulcerating carcinomas, irrespective of size. The roentgenological characteristics of carcinomatous ulcer are less definitive than the meniscus complex. Large niches are regarded with suspicion, but a large ulcer is not necessarily malignant. Other features suggestive of the possible malignant nature of the lesion are an elderly patient with a late onset of symptoms, the combination of histamine refractory achlorhydria and pyloric obstruction, persistent occult blood in the stool during and after treatment, incomplete response to adequate treatment, and situation of the lesion near the pylorus, on the greater curvature, or posterior wall, as well as certain features elicited by the gastroscopic examination.

The presence of a gastric lesion, however small, makes imperative adequate medical treatment and observation, if exploratory operation is not undertaken. This applies in particular to the middle-aged or elderly individual. Treatment is justifiable when the lesion is not frankly malignant as the majority of uncomplicated gastric ulcers heal readily under favorable conditions, and gastric resection, under average conditions, still carries a much higher mortality than the risk of death from carcinoma. The nature and degree of response to treatment are also important factors in the differential diagnosis.

Casberg, M. A.: Perforation as a Complication of Gastric Carcinoma. *Arch. Surg.*, 1940, 41: 937.

Perusal of the medical literature impresses one with the infrequency of references to perforation as a complication of gastric carcinoma.

In a series of 247 proved gastric carcinomas admitted to the St. Louis City Hospital there were 7 which were complicated by acute perforation and generalized peritonitis. All of the perforations occurred in men. The average age of the patients in the entire group was sixty-three years, as compared with an average age of fifty-one years for the patients with perforation.

Two personal cases of perforated gastric carcinoma are presented in detail.

The differential diagnosis between gastric perforations due to carcinoma and those due to peptic ulcers is difficult if the patient is seen after perforation has occurred. The differential diagnosis depends not so much on the physical findings as on the past history.

Immediate exploratory laparotomy is the therapy of choice. Should shock complicate the picture, parenteral fluids, blood transfusions, and other combative methods must be used in an effort to prepare the patient for an early operation. Once the gastric lesion has been recognized and explored, further surgical steps must depend on the extent of the process and the condition of the patient. Ideally, gastric malignant tumors should be resected, but in the great majority of cases the primary operation should be limited to closure of the perforation, resection being reserved for a later time, when the patient is better able to withstand it.

Technically, closure of a perforation due to a gastric cancer is more difficult than closure of one due to a peptic ulcer. The former is more friable and indurated and does not lend itself to repair with a purse-string suture or to other methods used in closure of a simple peptic ulcer. The simplest procedure is to cover the perforative site with a flap of greater omentum "tacked down" with interrupted absorbable sutures. After aspiration of the spilled gastric contents from the peritoneal cavity a rubber-dam drain should be introduced to the region of the perforation with exit through a stab wound in the upper part of the abdomen. Drainage is the procedure of choice in view of the fact that the latter cannot be closed with assurance that there will be no further leakage. Biopsy specimens should be taken from all perforating gastric ulcers.

JOSEPH K. NARAT, M.D.

Touroff, A. S. W., and Sussman, R. M.: Congenital Prepyloric Membranous Obstruction in a Premature Infant. *Surgery*, 1940, 8: 739.

Exclusive of hypertrophic pyloric stenosis, congenital obstructions of the stomach are very rare.

The case of congenital prepyloric membranous obstruction reported is described in detail by Touroff and Sussman. The patient was a white female born approximately four weeks before term. The mother's pregnancy was complicated by marked polyhydramnios, and the only other pregnancy had produced a premature child that died three days after birth. The father had two sisters, each of whom bore a single child. Both children died in infancy, one of cerebral agenesis and the other of mongolianism.

At birth the baby weighed 6 lbs. and presented no gross abnormalities. However, initial cyanosis was quite marked and responded to intensive treatment only after a five-hour period. No meconium was passed during or after delivery. Soon after being placed upon formula it presented symptoms of high obstruction. On the second day the urine was examined for bile and found positive. Roentgenograms taken on the fourth day were difficult to interpret, but presented evidence of an obstructive lesion in the distal portion of the stomach or very first portion of the duodenum. On the fifth day fairly deep jaundice was present; there was evidence of moderate dehydration; no spontaneous bowel movements or passage of even meconium had occurred; and enemas were not effectual.

Operation on the fifth postnatal day consisted of multiple incisions of the prepyloric septum and pyloroplasty (Fig. 1). No other congenital anomalies were found.

Postoperatively, periodic vomiting occurred during the first twenty-four hours, but the major portion

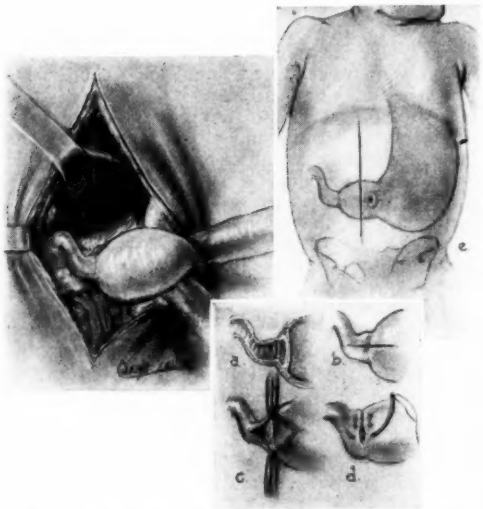


Fig. 1. Operative findings and procedure. Hypertrophied dilated antrum retracted toward the left, to expose duodenum and gastroduodenal junction. Note sharply demarcated pyloric ring and normal caliber of duodenum. Duodenum is elongated and rises sharply to reach head of pancreas. Entire liver displaced into right side of abdomen by distended stomach. Large bowel almost completely hidden. Small intestine empty and contracted. *a*, Cross section of antrum and adjacent duodenum showing site of mucous membrane septum in immediate prepyloric area; *b*, incision through proximal portion of duodenum and adjacent stomach; *c*, incision about to be closed at right angles to its original direction (Heineke-Mikulicz pyloroplasty); *d*, pyloroplasty continued; inner (continuous) suture completed; outer tier of mattress suture being placed; *e*, diagrammatic sketch of site and extent of incision.

of the feedings was retained. The vomitus contained bile which indicated patency at the operative site. The day after operation meconium and then stool were passed; thereafter the bowels moved several times daily. For eighteen days the postoperative course was considered satisfactory. At this time moderately severe pharyngitis was present, and secondary complete intestinal obstruction developed. However, five days later, as operation was about to be performed, the obstruction was relieved spontaneously. After a stormy course the patient was discharged five and one-half weeks after operation. Five months postoperatively x-ray studies revealed the gastro-intestinal tract to be normal except for rapid emptying of the stomach and intestinal hypermotility. Seventeen months after operation the child weighed 30 lbs. and was entirely free of gastro-intestinal symptoms.

Touroff and Sussman report that to the best of their knowledge this case is the first of its kind to be reported. It is one of the few successful attempts at major surgery upon a premature child and is the earliest pyloroplasty; also, it appears to be the earliest case of postoperative intestinal obstruction recorded. EARL GARSIDE, M.D.

Ask-Upmark, E.: On the Presence of a Deficiency Factor in the Pathogenesis of Peptic Ulcer. *Acta chirurg. Scand.*, 1940, 84: 55.

Among 7 cases of Addison's disease, in which the autopsy reports on the gastro-intestinal tract were complete, 2 peptic ulcers were found. The author believes that the history of epigastric pain so common in Addison's disease may indicate peptic ulcer. A long theoretical discussion leads the author to the following conclusions:

Addison's disease and experimental adrenalectomy may be associated with peptic ulcer. This may be due to incomplete intestinal absorption of the nutrients. Peptic ulcer also occurs in disorders of the liver and in infectious disorders in which the conversion or destruction of nutrients may be abnormal. Peptic ulcer may also be encountered in Graves' disease. The salient clinical features of the ulcer syndrome, such as seasonal periodicity, the benefit of adequate feeding, the aggravation by inadequate diet, and the improvement by blood transfusion, may all be explained by the occurrence of a nutritional deficiency. PAUL STARR, M.D.

Rivers, A. B., and Gardner, J. W.: Recurrent Peptic Ulcer. *J. Am. M. Ass.*, 1940, 115: 1779.

This study includes 65 cases of postoperative recurring ulceration. The exact situation of both the primary and secondary lesions was ascertained by roentgenographic evidence. The situation of the secondary ulcerations was confirmed by direct inspection of the tissues at operation. Only those cases were accepted for study in which the history included exact information regarding the syndrome under consideration.

An inquiry was made as to the situation, duration, and character of the pain, the time of its onset, and mode of relief. A special attempt was made to compare the characteristics of the original lesion with those of the one which developed postoperatively. Ten types of operative procedure are included in this group.

Results of this study of secondary ulceration tend to confirm such impressions as those which one of the authors (Rivers) previously expressed concerning the mechanism of the conduction of pain from peptic ulcerative lesions to the spinal cord. Uncomplicated peptic ulcer probably indicates its presence as a visceral phenomenon which asserts itself along the splanchnic nerves. Such a route, however, does not satisfactorily explain the varying shifts of pain that occur when ulcers venture beyond the confines of the bowel. These shifts of pain probably can be explained better by reference to one of the other mechanisms. Such mechanisms would include either the phrenic pathway in the case of a high-lying perforating gastric lesion, or a route along the sensory

spinal nerves. These nerves could be expected to produce a syndrome less rhythmic and clear-cut than the syndrome caused by uncomplicated ulcer, since they are sensitive to many stimuli in addition to the "adequate stimulus" producing pain over the splanchnic route.

The situation of the majority of recurring peptic ulcerations is in or near the site of surgical anastomosis if operation has been performed. The physical factor probably determines the site at which the ulcer will develop. The site of the maximal force of impingement of the chyme decides the site of erosion. The general characteristics of the symptoms of the recurring lesions are similar to those of the symptoms produced by the original lesions. A majority of secondary ulcerations tend to penetrate deeply and, therefore, produce symptoms which are less intermittent, cause more distress at night, and are less easily relieved by food and alkali. A great number of recurring lesions involve the site of surgical anastomosis with the production of more or less obstruction, which tends to distort somewhat the usual syndrome for ulcer. The projecting pain of perforating peptic ulcers is in all probability the result of direct stimulation of the spinal sensory nerves which produces referred pain in the distribution of the more highly differentiating peripheral or cutaneous branches of these nerves. When a gastric ulcer begins to produce pain in the tip of the shoulder, indicating use of the phrenic pathway, it can be assumed that deep penetration or active perforation has occurred.

Schlicke, C. P., Bargen, J. A., and Dixon, C. F.: Intestinal Obstruction; an Evaluation of Conservative Therapy. *J. Am. M. Ass.*, 1940, 115: 1411.

This paper is a report of the results obtained from treatment in cases of intestinal obstruction encountered at the Mayo Clinic from August 1, 1938, to July 31, 1939, inclusive. All types of obstruction are included: acute, chronic, simple, and strangulated, in both the large and small bowel. The chief purpose of this review is to obtain a broader and more inclusive evaluation of conservative therapy.

All cases were divided into two main groups (after the method of Wangensteen): simple obstructions and strangulation obstructions. There were 133 of the former and 33 of the latter, a total of 166 cases. The most common single cause of simple obstruction was carcinoma of the sigmoid or rectosigmoid; postoperative adhesions occupied second place.

In this study we have graded all simple obstructions as of high, medium, or low grade. This grading was arbitrary, independent of the site of obstruction, and determined on the basis of (1) the degree of distention; (2) the amount, duration, and character of the vomiting; (3) the duration and degree of obstipation; (4) the evidence obtained from a simple roentgenogram of the abdomen; (5) alterations in the blood chemistry; and (6) the amount of colic and the character of peristalsis.

A search was made to determine if there were any factors responsible for the recurrence of attacks of obstruction or the exacerbation of attacks already in progress which could be avoided. It was found that in 22 (16.5 per cent) of 133 cases of simple obstruction, the precipitation of an attack of obstruction (16.5 per cent) was caused by the administration of barium or too violent purgation, and in an additional 5 cases (3.8 per cent) barium seemed to be a factor in the precipitation of an obstruction.

Penberthy, G. C., Irvin, J. L., and Tenery, R. M.: Fluid, Salt, and Nutritional Balance in Patients with Intestinal Suction Drainage. *Ann. Surg.*, 1940, 112: 530.

The problem of fluid, mineral, and nutritional balance in patients during gastro-intestinal suction has been of great interest and caused much concern. All authors agree that during suction drainage there is great need for careful attention to the fluid and salt balance and they indicate that the maintenance of this balance may be effected only by the parenteral administration of fluids.

The authors claim that since the introduction of balloon-tipped tubes, the oral administration of fluids is more practical and in most cases maintains the fluid and mineral balance without the need of venous infusions. Four patients were studied. In this study the oral intake, as compared with the aspirated fluid in all cases, revealed that varying amounts of food, fluid, and salt were utilized by the patient despite constant suction drainage. It is only because of the greater absorbing surface afforded by the length of intestine above the tube tip that low ileal drainage affords better possibilities for oral feedings. However, during the early period of intubation, before the distention is controlled, parenteral fluids are imperative, since usually the patient not only fails to absorb fluid, but loses excessive fluids and salt from the gastro-intestinal tract.

The sodium and potassium balances are fairly well maintained by the oral intake.

The data presented by the authors indicate that in patients with low ileal drainage it is possible to maintain good fluid, salt, and nutritional balance if the patient ingests a sufficiently larger quantity of food, salt, and fluid than is removed by suction. However, even in cases with drainage from the lower ileum this should not be relied upon entirely. When suction is exerted at higher levels it is much more difficult if not impossible to maintain good balances, especially with regard to salt. The parenteral administration of fluids in conjunction with oral intake in excess of suction is important.

HOWARD A. MCKNIGHT, M.D.

Toyidzé, S. S.: Ligation and Thrombosis of Veins of Large Intestines. *Vestnik khir.*, 1940, 59: 622.

The author studied the rôle of the collateral circulation in thrombosis of the veins of the large intestines or after their ligation, with special attention to anastomoses between the portal system and that of

the vena cava inferior. The veins of the large intestines were selected for the study because the aforementioned anastomoses are particularly well developed in this portion of the digestive tract.

Three series of experiments were performed: (1) ligation of the ileocecocolic, right and median colic, and caudal mesenteric veins; (2) ligation of the aforementioned veins and production in them of thrombi by injections of from 1.5 to 4.0 c.cm. of a 30 per cent sodium chloride solution; and (3) production of a similar thrombosis in the minor veins of the large intestines in the aforementioned manner by injecting the thrombosing solution into the isolated trunk of the caudal mesenteric vein. All experiments were performed on dogs.

The author draws the following conclusions:

Ligation of the main veins of the large intestines produces signs of congestion, such as cyanosis or edema of the intestinal wall. These symptoms gradually subside and completely disappear after five days. The efferent collateral pathways are as follows: (1) portocaval anastomoses; (2) anastomoses between branches of the portal vein; and (3) the intramural venous reticulum. The first-mentioned structures are located in the region of the distal portion of the gut and represent the major part of all anastomoses, while connections between branches of the portal vein are less numerous and confined chiefly to the proximal portion of the large intestines. Ligation or thrombosis of the main venous trunks of the large intestines leads to various pathological changes in the intestinal wall, which depend on the development of the collateral circulation. In the proximal portion of the gut, with scanty anastomoses, venous thrombosis is followed by grave pathological changes in the form of ulcers or infarcts, while in the distal segment such serious lesions are relatively rare. More frequently a cyanosis, edema, mucous degeneration, or punctiform petechiæ in the mucosa develop; they completely subside after from twenty-two to twenty-four days.

Thrombosis of minor veins and the intramural venous network is accompanied by grave pathological lesions such as erosions, ulcers, or infarcts.

Serious pathological changes in the large intestines following venous thrombosis lead to intestinal hemorrhages and weakness of the animal. Hemorrhages from ulcers gradually lose their intensity and stop completely after three or four days. They are more intensive if they are sequelæ of infarcts and may prove fatal from fifteen to thirty-six hours after the operation.

Postoperative intestinal hemorrhages in man may be attributed to an interference with the return flow of the venous blood from the large intestines, as a result of venous thrombosis.

Ligation of the veins of the large intestines or their thrombosis, following a resection of the large intestines or a colostomy, interferes with the return flow of the blood and may lead to necrosis of the intestinal wall and disruption of its margins after separation of the sutures. JOSEPH K. NARAT, M.D.

Broders, A. C., Buie, L. A., and Laird, D. R.: The Prognosis in Carcinoma of the Rectum. *J. Am. M. Ass.*, 1940, 115: 1066.

Four hundred and thirty-two resected specimens of carcinoma of the rectum were graded and grouped according to Broders' and Dukes' classifications. The distributions of grade and class were studied in comparison with other investigations, and also in relationship to survival after operation. On the basis of the entire study, certain conclusions were reached:

1. The presence or absence of mucus loses importance as a guide to prognosis if histological grading is done by Broders' method.

2. Tumors of higher grades are more rapid in growth and their metastases cause the death of the patient earlier than those of lower grades.

3. The classification of the lesion according to Dukes is also correlated with postoperative life; the higher the class, the less the percentile survival.

4. A combination of both Broders' grading and Dukes' classification yields a prognosis of survival more accurate than either method taken separately.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Bonn, H. K., and Bachhuber, C. A.: The Surgical Treatment of Acute Cholecystitis. *Am. J. Surg.*, 1940, 49: 447.

In this survey of all biliary cases admitted to the Los Angeles County Hospital for the five-year period from 1933 to 1938, an attempt is made to determine the relationship between the complications and the mortality of acute cholecystitis, and the elapsed time from the onset of symptoms to the time of operation. The pathological diagnosis rather than the operative report was used as a criterion in all cases in which cholecystectomy was done.

During this period there were 955 patients admitted with a diagnosis of biliary disease. In the entire group, 704 operations were performed. Acute cholecystitis was diagnosed in 251 patients, but 6 cases are excluded because of insufficient data; this leaves 245. None of this group was operated upon, either because the patient refused or the surgeon objected. There were 15 deaths in this nonoperative group, a mortality of 6 per cent. Nine autopsies were done, and in all but 2 instances the cause of death was other than acute cholecystitis or its complications. All autopsies showed the presence of cholecystitis. Since 230 of these patients apparently recovered and were discharged in from five to fourteen days, it would appear that the incidence of perforation, gangrene, and abscess may not be so high as some observers report.

The operative cases are tabulated in three groups: Group I includes the patients operated upon within forty-eight hours of the onset of illness; Group II, those operated upon from the third to sixth day after the onset; and Group III, those operated upon after the sixth day.

In Group I there were 16 cases with 3 deaths, a mortality of 19 per cent. There were 5 cholecystectomies in females with no deaths, and 3 in males with 1 death. The pathological diagnoses were as follows: 2 cases of subacute and 1 case of marked subacute cholecystitis; 1 case of empyema, 1 case of gangrene, and 3 cases of chronic cholecystitis. There were 8 cholecystostomies which were evenly divided as to sex. There were 2 deaths, a male and a female. One case of hydrops and 1 of empyema were included.

In Group II there were 64 cases with 5 deaths, a mortality of 8 per cent. Forty-eight cholecystectomies were done, with 4 deaths, a mortality of 8.3 per cent. There were 36 in females (2 deaths) and 12 in males (2 deaths). The pathological diagnoses were: 7 acute, 9 subacute, 5 ulcerative, and 2 gangrenous cases of cholecystitis, 1 case with hydrops, and 24 cases of chronic cholecystitis. Sixteen cholecystostomies were done with 1 death, a mortality of 6.2 per cent. In 11 females there were no deaths. The pathology was given as 1 case of subacute and 1 of gangrenous cholecystitis and 1 case with empyema. In the 5 males there was 1 death.

In Group III there were 427 cases with 23 deaths, a mortality of 5.4 per cent. There were 390 cholecystectomies with 20 deaths, a mortality of 5.1 per cent. In this group 311 of the patients were females (13 deaths). The pathological diagnoses in these 311 cases included: 8 cases of acute, 58 of subacute, and 208 of chronic cholecystitis, 1 case with cholesterosis, 1 with gangrene, and 1 with hydrops, and 4 of purulent, and 21 of ulcerative cholecystitis. No report was given in 10 instances. There were 79 cholecystectomies in males, with 7 deaths. Three cases of cholecystitis were acute, 18 subacute, 45 chronic, 1 case presented empyema and 1 gangrene, and 7 were ulcerative. No report was given in 4 cases. Thirty-seven cholecystostomies were done, 27 in females and 10 in males, with 3 deaths, a mortality of 8.1 per cent. There was 1 death in a female. Three empyemas were included. In the 10 males, 2 deaths occurred. One case of gangrene, 2 cases of perforation, 3 of empyema, and 3 of chronic cholecystitis made up this series.

The authors point out that Group I is too small a series to have positive value. In Group II almost a third of the patients showed subsidence of the pathology, but considerable acute pathology remained in the other patients; yet the mortality was considerably lower than that in Group I. In Group III minimal clinical manifestations were present at the time of operation, yet acute lesions were present in 31 per cent of the patients. The mortality, however, dropped to 5.4 per cent.

The authors believe that operation within forty-eight hours carries too high a mortality to warrant much consideration, especially in their own hospital, which is a charity institution. They believe that no absolute time can be set as the optimum for operation. Advanced pathology may be present with minimal clinical signs. Except for perforation and gangrene, which may occur at any and all times, the mortality will be lowest when operation is done late.

JOHN L. LINDQUIST, M.D.

Macdonald, D.: Postoperative Perfusion of the Biliary Ductal System. *Canadian M. Ass. J.*, 1940, 43: 411.

The author reports a new postoperative method of cleansing the biliary ducts, and of application of thermostatically controlled heat to the interior of the biliary tract.

Since cholecystectomy does not remove all the pathological changes in biliary-tract disease, an effort to produce a normal duct system should be made in selected cases. This can be done by using a common-duct drain or gall-bladder-stump drain as part of a perfusion apparatus, which should result in a reduction of the incidence of postoperative symptoms.

On the tenth or twelfth postoperative day, following medication designed to relax the sphincter of Oddi (olive oil, magnesium sulfate, amyl nitrite, or glyceryl trinitrate), the ducts are perfused with heated (from 110 to 115° F.) saline solution, antiseptics, or solvents by means of a continuous intravenous apparatus for from thirty to forty-five minutes. No morphine is given. The pressure is controlled by the height of the fluid level. The jar containing the perfusing fluid can be enclosed in a water jacket so that the fluid can be heated to any desired temperature. The procedure can be performed easily by the patient at home. A cholangiogram should always be made before perfusion, because of the danger of impacting a calculus by irrigation.

In favor of the new method are the facts that drainage is "down hill" along natural anatomical routes, rather than "uphill" as in T-tube or gall-bladder drainage; that the intrahepatic ducts can be cleansed and heat applied to their interior; that the patency of the bile passages is preserved; that the thorough and complete drainage of the ducts should theoretically diminish the incidence of pancreatitis; that slow dilatation of the sphincter is produced, which decreases the likelihood of postoperative colic; and that the procedure can be fully evaluated by examination of the washings collected through a duodenal tube.

S. LLOYD TEITELMAN, M.D.

Bresnihan, P.: Experimental Study of the Pathogenesis of Acute Necrosis of the Pancreas (Experimente zur Pathogenese der akuten Pankreasnekrose). *Beitr. z. path. Anat. u. z. allg. Path.*, 1939, 102: 424.

After a short collective review of the literature, the author describes animal experiments conducted for an investigation of the causes of acute necrosis of the pancreas. He proceeds from the theory of Chiari, according to which the cause of acute necrosis of the pancreas is to be found in an overflow of bile into the pancreatic duct. The two pancreatic ducts in dogs were therefore connected with the biliary tract by

means of specially constructed glass and rubber cannulæ which made possible an influx of bile into the pancreas. In 6 of 15 cases the experiment succeeded, i.e., the cannula remained in the ducts up to the time of death or sacrifice of the animal. All these cases showed macroscopic as well as histological evidence of more or less extensive necroses of the pancreas. The picture corresponded exactly to that seen in human pathology.

In the control experiments as well as in cases in which the operation or experiment did not succeed, no signs of pancreatic necrosis could be demonstrated. It was therefore concluded that the establishment of a communication between the biliary and pancreatic ducts presented the prerequisite for development of acute pancreatic necrosis.

From the results of the experiments, and on the basis of further control experiments, in which the bile was injected into the free abdominal cavity, it was concluded that the fatty tissue necrosis was not produced by bile which had passed via the pancreas into the abdominal cavity. Rather, the passage of pancreatic juice into the abdominal cavity and the action of its lipolytic ferment upon the fatty tissue of the abdominal cavity was regarded as the cause of the fatty tissue necroses. As for the cause of the pancreatic changes themselves, the effect of the activated pancreatic ferment constitutes the determining factor, although the pancreas did not remain sterile in all animals. Such an interpretation is indicated by the histological findings (regular hemorrhagic inflammation like that following the injection of activated trypsin into the skin) as well as by the fact that pancreatic necrosis developed more rapidly in animals receiving injections of hypophysin after operation.

Finally, attention is drawn to the analogy between the experimental results and the conditions in human pathology, in which the picture of acute pancreatic necrosis may develop in calculous obstruction of Vater's papilla with persistence of communication between the two tracts.

(WELCKER). EDITH SCHANCHE MOORE.

MISCELLANEOUS

Ransom, H. K., and Kay, E. B.: Abdominal Neoplasms of Neurogenic Origin. *Ann. Surg.*, 1940, 112: 700.

The clinical and pathological features of 18 nerve-sheath tumors of the abdomen are presented and an attempt is made at their correlation. The authors classify abdominal neoplasms of neurogenic origin as follows:

I. Nerve-sheath tumors
  A. Benign
    1. Neurolemmoma (schwannoma — perineurial fibroblastoma)
    2. Neurofibroma (of type associated with von Recklinghausen's disease)
    3. Cirsoid or plexiform neurofibroma
    4. Ganglionated neurofibroma
  B. Malignant
    1. Neurogenic sarcoma
II. Neuroblastic tumors of sympathetic system
    1. Sympathoblastoma
    2. Paraganglioma
    3. Ganglioneuroma

The authors have purposely excluded neuroblastic tumors from this report.

There is no uniformity of opinion as to the histogenesis of nerve-sheath tumors. Some believe they arise from the sheath of Schwann and, thus, are of neuro-ectodermal origin; others that they originate in the connective-tissue sheath of Henle and, thus, are of mesodermal origin. The authors believe that the exact site of origin cannot be stated with certainty since both types of tissue have a similar histological architecture. They believe that certain types of nerve-sheath tumors, which they designate "neurolemmomas," are composed primarily of Schwann cells, while others such as the neurofibromas are composed of both Schwann cells and fibrous tissue. The latter tumors are usually associated with a generalized neurofibromatosis. However, the neurogenic tumors of the abdomen are usually solitary and not associated with either multiple abdominal or cutaneous tumors. In only 2 of the 18 cases were there stigmata of von Recklinghausen's disease.

The abdominal neurolemmomas are confined largely to the stomach and retroperitoneal regions. In the gastro-intestinal tract they arise from the sheaths of the sympathetic fibers of the submucosal and myenteric plexuses. In this series definite attachment to nerves could not be demonstrated. Grossly the neurolemmomas are usually well encapsulated, slowly expanding neoplasms. They are usually solid but may be cystic and they are less firm than a carcinoma. The contour is oval or round and frequently nodular. The cut surface has a whorled appearance and is gray to gray-yellow or gray-pink. Histologically, there are areas of palisaded rows of cells and areas of whorling or interlacing bands (Antoni Type A and Type B tissue, respectively). The tumors least likely to become malignant are those showing the most striking palisade arrangement. There were 6 cases of neurolemmoma in this series.

The term neurofibroma is here used to designate that type of nerve-sheath tumor usually found associated with von Recklinghausen's disease. These tumors differ from the neurolemmomas in that they contain more fibrous and fibroblastic tissue and bands of elongated spindle cells. They may become malignant. There were no examples of the plexiform or cirsoid neurofibroma in this series. There were 3 neurofibromas all involving the intestine.

There was 1 ganglionated neurofibroma located in the retroperitoneal space. These tumors arise from the sheaths about the ganglia and are usually retroperitoneal. The ganglion cells are of an adult type and take no part in the tumor growth but are incidental to the location of the tumor. This dif-

ferentiates these tumors from ganglioneuromas which are known to be neuroblastic in origin and contain the ganglion cell as the actively growing tumor cell.

Half the tumors in this series were neurogenic sarcomas. These tumors may arise upon neurolemmomas or may arise as sarcomas. Most evidence favors the former view. They are locally malignant but in the majority of cases fail to give rise to distant metastases. These tumors are of two types: (1) the large infiltrating non-encapsulated sarcoma occurring in the retroperitoneal regions and mesenteries, and (2) the sarcoma found in the gastro-intestinal tract, encapsulated except for occasional breaks in the capsule where infiltration is seen. Histologically they resemble other spindle-cell sarcomas, but certain areas of whorling, interlacing bands, or palisades of cells identify their origin.

The distribution of the 18 neurogenic tumors was as follows: stomach 7 cases, intestine 3, mesenteries 2, and retroperitoneal space 6 cases. In view of their distribution no pathognomonic symptoms of neurogenic tumors are to be expected. Those located in the stomach and intestine give rise to hematemesis or melena because of a tendency toward ulceration. Intussusception may occur with an intraluminal tumor of the intestine. The patient is usually in a good state of nutrition in spite of a long history of illness and repeated hemorrhages. Palpation may not reveal a mass. Roentgenograms may show evidence of an intraluminal or extraluminal abdominal mass.

Generally speaking, the nerve-sheath tumors are not frequently encountered in the abdominal cavity. Certain organs such as the esophagus, colon, and rectum seem to be singularly immune, whereas the stomach is involved relatively often. Unlike many of the more commonplace abdominal neoplasms the neurogenic tumors are often discovered in unusual or bizarre places such as the mesenteries, omenta, or retroperitoneal spaces. They are expansively growing lesions and thus gradually tend to involve multiple adjacent organs secondarily. Eradication of advanced growths necessitates formidable surgical procedures.

In only 3 of the 8 neurogenic sarcomas in this series were distant metastases observed. Good end-results can be obtained by thorough removal of neurogenic sarcomas because of their tendency to remain localized for a long period of time. None of the neurogenic tumors can be considered entirely benign since they may become malignant or so large that surgical removal is formidable.

JOHN L. LINDQUIST, M.D.

GYNECOLOGY

UTERUS

Das, P.: Inversion of the Uterus. *J. Obst. & Gynaec. Brit. Emp.*, 1940, 47: 525.

The major portion of the existing literature on inversion of the uterus has been collected and reviewed for this paper; it also includes a statistical study of 391 additional cases.

Probably, inversion was recognized several thousand years B.C. as there are passages in the Ayurvedic literature which suggest that it was known to the Hindus. However, the Arabian physician, Avicenna, who lived in the early part of the eleventh century A. D., for the first time gave a clear description of the differential diagnosis between inversion of the uterus and prolapse.

This complication may develop either in the puerperal or non-puerperal organ; it is almost five times more common in the former. Most writers believe that it occurs in about 1 of every 30,000 labors. However, the incidence is higher in India, 1 in every 8,500 labors. Inversion may be either acute or chronic. The distinction between acute or chronic in the puerperal variety is determined by the interval between the time of the accident and the time when treatment is sought; for the acute this is limited to thirty days. In the author's series 83.65 per cent of the inversions occurred in a puerperal uterus, and 73.4 per cent of these were acute whereas, of the non-puerperal cases, 91.4 per cent were chronic.

Inversion of the uterus may be either complete or incomplete. If any part of the fundus passes through the cervical ring, it is called complete inversion. Practically all puerperal inversions are complete and associated inversion of the vagina is comparatively common.

The conditions necessary for the production of inversion of the uterus are thought to be, (1) sudden emptying of the uterus after distention of its cavity, (2) thinning of its walls by the gradual development in it of some tumor, and (3) a dilated cervix. Both pregnancy and fibroid polypi predispose the uterus to inversion by furnishing the aforementioned conditions; consequently, almost all inversions occur in one or the other of these circumstances. Puerperal inversion may be either spontaneous or traumatic. Spontaneous inversion may result from vomiting, sneezing, straining, distended intestines, gas in the abdominal cavity, a short umbilical cord, or the weight of the placenta. However, in the majority of instances some act of violence, such as an improper method of expressing the placenta or deliberate traction on the umbilical cord, is responsible for the accident, and such cases are considered traumatic.

Paresis of some portion of the uterine wall, particularly at the site of placental attachment, is the etiological factor considered most important for spontaneous inversion. There are those who contend that this paresis is due to adrenaline-anemia. Others have considered both unnatural relaxation and contraction of the uterus as essential. Fundal attachment of the placenta is so general in cases of inversion, that it has been regarded as being almost essential to the production of this complication. A partially detached placenta with an accumulation of a large amount of blood behind it may, by the weight of this blood, be of importance as a predisposing factor. An adherent placenta and organized placental polypi may also be responsible.

There are many cases in which inversion occurred as the result of the injudicious use of pituitary extract, ergot, and castor oil. Inversion has occurred after abortion and miscarriage, but it is usually associated with some direct trauma, such as pulling on the umbilical cord or forcible extraction of the fetus.

In the puerperium inversion occurs with almost equal frequency before and after delivery of the placenta. In the majority of cases, however, it begins at the end of the second stage of labor and is usually completed by the end of the third stage. On the other hand, inversion had been known to occur days, or even weeks, after the completion of the third stage.

Practically all instances of non-puerperal inversion are caused by fibroid tumors. Such tumors as a rule are submucous; they are either sessile or have a short thick pedicle. Inversion is especially likely to occur during extrusion of the tumor. Inversion has also been observed in patients with either sarcoma or carcinoma of the uterus.

In the author's series, 40 per cent of the puerperal cases were of the spontaneous type. Traction on the umbilical cord seemed to be responsible in 21 per cent and an improper method of expressing the placenta in 19 per cent. The placenta was found either completely or partially adherent in the fundus in 75 per cent of the cases. Five cases occurred during the second stage of labor, i.e., the inversion took place before the child was completely born; 72.3 per cent occurred during the third stage; 14.2 per cent within the first twenty-four hours following delivery, and 9.8 per cent between the second and thirtieth day of the puerperium.

Symptoms. The symptoms of *acute* inversion vary greatly. There may be but few. Usually, however, acute inversion is characterized by shock, exhaustion, pallor, coldness, feeble pulse, hemorrhage, and pain. The amount of uterine bleeding varies; usually it is not excessive. The profoundness of the shock is in sharp contrast with the moderate loss of blood.

The duration of life with *chronic* inversion of the uterus varies considerably: it depends upon the original condition of the patient and her ability to rally during the intervals of monthly bleeding. The

symptoms of chronic inversion are menorrhagia, metrorrhagia, leucorrhea, and pain. Retention of urine is not uncommon.

Diagnosis. *Acute* inversion can be suspected only from the patients' subjective symptoms. The diagnosis is easily made by vaginal examination when an intensely congested rather soft, pear-shaped bleeding tumor is found. The cervical ring, more or less contracted, is usually found encircling the tumor. If the placenta is still attached, the diagnosis is obvious.

The physical signs of *chronic* inversion are so similar to those of a polypoid tumor that great care is necessary to differentiate them. If one is cautious and palpates accurately for the exact position of the uterus, and passes a sound into the uterine cavity, he can distinguish these lesions with certainty.

Prognosis. Acute puerperal inversion is a condition that demands prompt and intelligent management. The earlier it is recognized and treated, the better the prognosis. Without treatment the majority of acutely affected patients die of shock or hemorrhage. The average mortality in acute cases in recent years has been about 35 per cent.

Chronic inversion is not so alarming but death may result from repeated or continuous hemorrhage.

Prophylaxis. The most important prophylactic measure is avoidance of interference during the third stage of labor. Under no condition should the umbilical cord be dragged upon to facilitate separation of the placenta, and an improper method of expressing the placenta should never be employed. Before leaving the patient the obstetrician must ascertain that the uterus is firmly contracted and in its normal position.

Treatment. The treatment of acute inversion depends upon the amount of shock, the effect of hemorrhage, and the time of detection of the inversion. In cases unaccompanied by symptoms which are recognized immediately after the inversion occurs, manual replacement yields the best results. The most important cause of failure of manual reposition is a constriction of the cervical collar; intramuscular injections of adrenaline have been recommended to produce relaxation of the cervix. After replacement, firm contraction of the uterus should be promoted by hot intra-uterine douches, injections of ergot and pituitrin, and uterine massage, if needed.

When inversion is accompanied by shock or collapse, immediate replacement is dangerous and often results in death. The shock should be treated first and attempts at replacement postponed until the patient has rallied. Obstetricians are not agreed whether the placenta should be removed before or after replacement of the uterus. When manual reposition fails or when the replacement has not been affected within the first forty-eight hours, it is advisable to wait until local swelling and infection have subsided. Then one may use an Aveling's repositor or resort to the Huntington abdominal operation.

The treatment of chronic inversion depends upon its type, i.e., puerperal or non-puerperal. In the non-puerperal cases due to tumor, vaginal hysterectomy with removal of the tumor is considered the treatment of choice. In the chronic puerperal cases, treatment may be either operative or non-operative. Non-operative treatment aims at replacement of the inverted uterus either gradually, by means of repositors, or rapidly, by taxis. For the most part, however, rapid reduction has been abandoned in favor of more gradual replacement. Operative treatment may be either conservative, in which the uterus is left in such condition that it is capable of function, or radical, in which the uterus is removed. Two types of operation have been employed, the Haultain abdominal operation and the more popular Spinelli vaginal procedure. Removal of the uterus by vaginal hysterectomy has a place in the treatment of chronic puerperal inversion also. Operative treatment of this chronic group has the following advantages: (1) manipulations are reduced to a minimum; (2) adhesions can be dealt with directly; (3) the constricting ring can be dilated; and (4) the rigid wall of the uterus can be managed in a manner which makes reposition easier and more certain. Operations of the Spinelli type offer the best prognosis.

END-RESULTS IN THE TREATMENT OF PUERPERAL INVERSION

	Acute		Chronic		
	Cures	Deaths	Cures	Deaths	Total
Manual reposition	145	24	22	2	193
Repositor	7	1	23	0	31
Laparotomy and reduction	11	0	5	0	16
Colpeurynter	3	1	2	0	6
Colpohysterotomy	0	0	15	0	15
Abdominal hysterectomy	4	0	1	0	5
Vaginal hysterectomy	2	1	3	0	6
Amputation	7	3	12	2	24
Spontaneous reduction	3	0	7	0	10
Douche	2	0	1	0	3
Total	184	30	91	4	309

It is apparent, from the foregoing table, that reposition was used in the greatest number of puerperal cases. However, laparotomy followed by a reduction in acute cases, and the use of the repositor or colpohysterotomy in chronic cases, offer the best prognosis. GEORGE H. GARDNER, M.D.

Cattaneo, L.: A Case of Intraligamentary Bladder Complicating a Retrocervical Fibromyoma (Su un caso di vescica intraligamentaria complicante un fibromioma retrocervicale). *Arch. ital. di urol.*, 1940, 17: 277.

Distinction is made between the bladder which is infraligamentary and that which is intraligamentary. In the first case, the vesico-uterine reflection of the peritoneum is elevated by the bladder; in the second the organ has found its way further cephalad and occupies a space limited by the two leaves of the

broad ligament. Only 14 of such anomalies have been reported and the majority of them were infraligamentary.

Cattaneo reports the case of a forty-eight-year-old house-maid who complained of dysuria, difficulty in initiating micturition, and occasional retention. Physical examination showed a moderate hypertension, with evidence of mitral stenosis and insufficiency with slight decompensation. The urine contained abundant globules of pus. The posterior wall of the vagina was found on pelvic examination to be elevated by a mass the size and form of an orange which filled the pouch of Douglas. The body of the uterus was difficult to make out and appeared to form a part of the solid mass which was incarcerated in the true pelvis. On the basis of these findings, a diagnosis of retrocervical intraligamentary fibromyoma was made.

At operation a tumefaction was found which was definitely cystic and distended the right broad ligament. The walls of the tumor, however, appeared to be formed of muscle tissue. Catheterization of the bladder was then performed and resulted in the reduction of the intraligamentary mass after the removal of 300 c.cm. of urine. The other side was then examined and the uterus was found to contain multiple fibromyomas, one large portion of which occluded the pelvis. Total hysterectomy was then performed and was followed by an uneventful recovery.

Rare as such cases are, their pathogenesis is of practical as well as theoretical interest. Of particular note is the fact that the anterior parietal peritoneum, after being reflected over the symphysis, descended almost to the inferior margin, and thus caused the bladder to rise higher with relation to the anterior aspect of the uterus. The author considers this abnormality to be congenital. The development of the fibroids which push the bladder still higher and exert pressure on the urethra accounts for the symptoms and new relationships. Thus the bladder which is both infraligamentary and intraligamentary should probably be considered as being secondarily affected, in contradistinction to the congenital intraligamentary bladder. EDITH FARNSWORTH, M.D.

Gerlach, W.: Early Histological Diagnosis of Pavement-Epithelium Carcinoma of the Portio (Ueber die histologische Fruehdiagnose des Plattenepithelcarcinoms der Portio). *Ztschr. f. Geburtsh. u. Gynaek.*, 1940, 121: 1.

Formerly the criteria for the diagnosis of a pavement-epithelium carcinoma of the portio included destructive growth in the musculature, atypical cells, and mitoses. These signs are still extremely important today, but they are usually present in far-advanced cases in which diagnosis presents no particular difficulty. It is of the greatest importance to be able to diagnose definitely the tiniest beginning carcinoma, or to be able to recognize it as such from superficial scrapings by biopsy or curettage. Great difficulty is encountered in the differentiation from the benign pavement-epithelium proliferation in erosion glands and mucosal polyps, the so-called epidermization. Robert Meyer, in particular, has made a study of this problem and presented the basis for definite differentiation between benign and malignant proliferation. In benign epidermization there is likewise an apparent depth penetration with invasion of the glandular tubules by the pavement epithelium which fills them without any significant change in their shape. The carcinomatous epithelia penetrate into the lumen of the glands, changing their shape to larger, blunt club-like forms. Another striking feature is the marked susceptibility to stains of the carcinoma cells. Carcinomatous epithelium is only rarely involved in inflammatory liquefaction, which is almost always a sign of benign proliferation. The glycogen deficiency described by Lahm and others as characteristic of pavement-epithelium carcinoma is not so constant as to be of value in confirming the diagnosis.

On the basis of 76 selected cases all diagnostically significant possibilities are discussed. For the clinic it is recommended that a curettage be performed in addition to every exploratory excision and *vice versa*. (MAUER). EDITH SCHANCHE MOORE.

ADNEXAL AND PERIUTERINE CONDITIONS

Pallos, K.: Theca-Cell Tumors: Clinical and Pathological Contributions (Beiträge zur Klinik und Pathologie der Thecazellengeschwuelste).

Two personal cases of theca-cell tumors from the Woman's Clinic II in Budapest are added to the 31 cases in the literature, which were first described by Moretti and Arregoni (1927) and then by Loeffler and Priesel (1931).

The first case was that of a fifty-two-year-old woman who had undergone curettage twice previously for irregular bleeding and both times was found to have glandular hyperplasia. Since the bleeding did not stop after the curettages, the patient returned to the clinic after one year of almost constant bleeding. The uterus was freely moveable, in "antevertiert-flektierter" position, and as large as a fist; the adnexa were normal. Another curettage was done and, again, glandular hyperplasia was found. Six days later x-ray castration was performed and resulted in amenorrhea which lasted for six months. Because of the recurrence of bleeding, the uterus and adnexa were completely removed vaginally. The uterus was markedly enlarged, with a thickened endometrium and fundal polyps. On its posterior wall there was a pedunculated myoma the size of a nut. The left ovary was atrophic and the right had been changed into a knobby tumor of the size of a nut, surrounded by a smooth connective-tissue capsule through which small and large butter-yellow areas were visible. Histologically there was a glandular hyperplasia of the endometrium with endometrial polyps and a slight degree of adenomyosis of the inside of the uterus. The ovarian tumor was fibromatous in character. In some areas the fusiform cells were

transformed into closely packed polyhedral cells of epithelial type. These cells, so similar to the cells of the theca interna, had a delicate intracellular network and contained, as did the fibromatous part, lipoid substance which stained readily with Sudan and Scharlach red.

The second specimen was designated in the laboratory protocol as a mixed-cell sarcoma and as such was preserved in the museum of the clinic. The fifty-one-year-old patient, after one year of menopause, had bled irregularly for one year, the duration of bleeding sometimes being two weeks. A period of amenorrhea ensued and lasted until admission of the patient who complained of enlargement of the abdomen and pain of three years' duration. To the left of the somewhat enlarged uterus, an ovarian tumor about the size of a fist and a half was found; it was moveable and knobby. The tumor which was removed was pedunculated and had undergone torsion. Healing per primam followed. The condition of the uterus and the fate of the patient were not recorded. Macroscopically and microscopically the tumor was identical with the one which was just described.

A review of the morphological and clinical findings in theca-cell tumors, which are sharply differentiated from other ovarian tumors, was presented. The tumors were always unilateral (21 right, 11 left). The smallest was of the size of a bean, the largest of the size of a head. Usually they were of the size of a nut, an egg, or a fist, surrounded by a connective-tissue capsule, smooth or slightly knobby, remarkably hard with a gray-white surface layer, and were marked with typical small or large yellow spots. Histologically, in addition to the spindle-shaped tissue cells, large polygonal and epithelioid cells were found close together. These cells had light cytoplasm and large nuclei and resembled the luteinized cells of the theca interna. The gradual transition of the two cell types (fibrous and theca cells) was easily demonstrated since even in the parts containing theca cell the desmoid character was retained. Both cell types contained lipoids which consist principally of cholesterol and its ester. The lipoid content is not a sign of regressive changes, but of vitality or function of the cells. Most of the women with these tumors were at least fifty years old (18); 7 times the tumor was found in women between twenty and fifty years of age; and 3 times in women under twenty years of age. The youngest patient was sixteen, the oldest ninety-two.

Clinical symptoms were irregular bleeding and pressure symptoms caused by the size of the tumor. In 11 cases there was no complaint of irregular bleeding. In 20 of the remaining 22 cases bleeding was found. Sometimes metrorrhagia alternated with amenorrhea. The hyperplastic uterine mucosa was plainly found to be the cause of the bleeding (hyperplasia in 16 cases, atrophy in 2 cases, and in 15 cases no information was given).

The tumor is almost always benign; only 3 authors describe malignant cases with metastases, frank ascites, and clinical and histological indications of malignancy. The uterine bleeding, the hyperplastic myometrium and endometrium, and the myomas and the adenomyomas associated with the tumor indicate hormonal activity on the part of the tumor. It has a close affinity to the granulosa-cell tumor, which is not surprising since the theca-cell tumor as well as the granulosa-cell tumor develops from the mesenchyme.

Therapeutically the only course is to remove the tumor, after which the irregular bleeding always stops. The theca-cell tumor appears to be more resistant to the x-rays than the granulosa-cell tumor.

(Hans Heidler). Ronald R. Greene, M.D.

EXTERNAL GENITALIA

Pachner, F.: Artificial Vagina (Kuenstliche Scheide). *Gynaekologie*, 1939, 4: 142.

The author reports on 7 cases of construction of an artificial vagina. In 1 case a vagina was constructed before the patient's twenty-third year from a resected loop of ileum, by the method of Baldwin, Haeberlin and Mori. The patient is now married for the third time and her husband is unaware of the operation. In 2 cases a portion of the rectum was resected, according to Schubert's method, and used for the vaginal construction. The functional result was good in both cases; however, in 1 case the rectum could be sutured only under strong tension and 2 rectovaginal and 1 sacral fistula developed. After several plastic operations there remained only a very small rectovaginal fistula which caused only slight discomfort to the patient. Two cases were operated upon by the skin-flap plastic method of Kirschner and Wagner. The functional results were good except that the vagina was somewhat short.

Gambarov's method, in which only one wound cavity is formed and is kept open by a prothesis and dilatation until epithelization occurs, was used in 2 cases. In the last case the wound cavity was filled with a "skin-pulp" on the eighteenth postoperative day. This skin-pulp was prepared by mixing equal parts of vaseline, cod-liver oil, and finely divided particles of skin obtained with sterile precaution from the back of a recently deceased fetus. After four days the minute skin islets had grown attached. The anatomical and functional results of Gambarov's operation were so satisfactory that the author looks upon it as the best method.

(R. K. Felkel). John L. Lindquist, M.D.

Ferreira, Marques, J., and Vieira, M.: Lipschuetz Disease—Ulcus Vulvæ Acutum (Maladie de Lipschütz). *Arq. de patol.*, 1940, 12: 123.

Ferreira Marques and Vieira report a case of Lipschuetz disease in a girl twelve years of age—the first case of this disease to be reported in Portugal. While earlier writers called attention to the appearance of ulcers on the vulva, usually accompanied by slight fever and sometimes by cutaneous and buccal lesions, Lipschuetz in 1912 was the first

to describe the condition as a clinical entity (ulcus vulvæ acutum) having a definite bacteriological cause.

Lipschuetz disease occurs most frequently in girls and young women who are virgins, from fourteen to twenty years of age. The first symptom is pain, sometimes associated with redness and swelling, in the vulva; there is usually slight fever, and occasionally a considerable rise in temperature and chills. The ulcers then develop; usually they involve both the labia minora and majora, and sometimes they extend to the anus. Four types of ulceration are distinguished: (1) the acute or gangrenous type with some necrosis; (2) the subacute or "venereal" type, in which the lesions resemble chancroid; (3) the miliary type in which the ulcers are very small but numerous, found in association with the "venereal" type of ulcer; and (4) a single ulcer simulating early syphilitic chancre. A bacillus named by Lipschuetz the "bacillus crassus" is always found in the ulcers, sometimes associated with staphylococci or the pseudodiphtheria bacilli. The bacillus crassus is from 1 to 3.5 μ. in length; it is Gram-positive and sometimes occurs in short chains; it is immobile and a facultative anaerobe; it grows in a gelose-ascites medium or in the Liborius-Veillon medium, and also in a glucose-liver medium described by Okamoto; the cultures have a hairy appearance. The lesion of ulcus vulvæ acutum is very vascular, the walls of the blood vessels being thickened and surrounded by lymphocytes; the capillaries and precapillaries are chiefly involved, sometimes the venules, but rarely the small arteries. These pathological changes in the blood vessels distinguish the ulcers from any other lesion found on the vulva. In cases of the gangrenous type of ulcer, there is frequently an associated erythematous lesion of the skin, polymorphous or papulopustulous, and there are also small ulcers in the mouth. The bacillus crassus is found in both the skin and the mouth lesions.

In the authors' case the patient was a girl twelve years of age, who had begun to menstruate; she had always been in good health. She developed fever and a feeling of heat and pain in the vulva; the temperature rose to 40 degrees and was associated with malaise, chills, and headache. The ulcers on the vulva developed on the third day, and later a papulopustulous erythema appeared on the extremities. The vulvar lesions were of the gangrenous type and the bacillus crassus was isolated from them in large numbers. The patient recovered in seven weeks, but the labia minora had been entirely destroyed and the labia majora partially destroyed by necrosis; the scar was soft, showing no trace of sclerosis.

There were several points of interest in this case which the authors noted: the age of the patient, who was younger than the patients in the typical cases and had just begun to menstruate; the extensive destruction of the vulvar tissues (the authors find no similar case reported); the duration of the symptoms, which usually does not exceed two or three weeks; and the severity of the general symptoms, which suggested a septicemia.

ALICE M. MEYERS.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Pomerance, W., and Daichman, I.: The Effect of a Salt-Poor Diet During Pregnancy upon the Duration of Labor. *Am. J. Obst. & Gynec.*, 1940, 40: 463.

There were 46 patients in the original group of patients on a salt-poor diet, 29 primiparas and 17 multiparas. The average lengths of labor in the two groups were 9.6 hours and 6.5 hours, respectively. In the control series there were 49 patients, 33 primiparas and 16 multiparas; the average lengths of labor were 22.9 hours and 9.0 hours, respectively. In the second group on a salt-poor diet there were 32 patients, 22 primiparas with an average labor of 10.4 hours, and 10 multiparas with an average length of labor of 4.7 hours.

It would seem quite evident, from a study of the 78 patients on a salt-poor diet with adequate control, that there is a definite reduction in the duration of labor following the use of such a diet during pregnancy. EDWARD L. CORNELL, M.D.

LABOR AND ITS COMPLICATIONS

Tapfer, S.: Studies on the Significance of the Follicular Hormone in Labor (Untersuchungen ueber die Bedeutung des Follikelhormons fuer die Geburt). *Arch. f. Gynaek.*, 1940, 170: 68.

Castrated guinea-pigs were given a preliminary treatment of varying duration with varying doses of follicular hormone. The response of the uterine cornua to 0.001 Voegtlin units of orasthin was then compared to that occurring in untreated castrated guinea-pigs (Magnus-Kehrer specimens). When follicular hormone is absent the uterus does not have the capacity for rhythmic activity and responds to posterior pituitary hormone by a gradual increasing tonus terminating in a tetanic condition. Follicular hormone endows the uterus with the capacity for responding to posterior pituitary hormone with rhythmic contractions, thus counteracting, as it were, the production of the tetanic state. Under the influence of the follicular hormone, the uterus responds to various stimuli with regular labor pains. This effect is produced not only by mechanical and thermal stimuli, but also by ergot preparations. Thus, for instance, an almost full ampoule of gynergen added to 9 c.cm. of perfusion fluid will produce only rhythmic contractions in the uterus of an animal having received the preliminary treatment.

In 3 women in the third, fourth, and fifth months of normal pregnancy, the latter could not be interrupted by the administration of from 47 to 95 mgm. of progynon B oleosum over a period of from seven to ten days. On the contrary, in 3 patients with retained miscarriages, the administration of from 45 to 60 mgm. of progynon resulted in expulsion of the dead fetus within from twelve to fifteen days. Postpartum palpation was necessary in only 1 of these 3 cases. Also in the second half of pregnancy expulsion of the dead fetus could be accomplished only by use of follicular hormone (from 30 to 150 mgm. in from four to sixteen days) in 4 cases.

The effect of the follicular hormone upon the course of labor was studied in 20 primiparas of more than thirty-five years of age, 20 primiparas not receiving the follicular hormone being used as controls. Obstetrical interventions were required more frequently in the latter, and this same group had to remain nearly twice as long in the hospital as that which received 5 mgm. of follicular hormone from one to four times during labor.

Progynon will reduce the number of forceps operations in cases of primary insufficiency of labor pains.

In 1 case of rachitic narrow pelvis, after the administration of 10 doses of 5 mgm. of progynon B, the symphysis was twice as wide post partum as it was five months later. In 4 cases of apparent protracted pregnancy, delivery followed the administration of from 65 to 130 mgm. in from eight to fifteen days. The author now makes it his practice in cases of protracted pregnancy to give two doses of 5 mgm. each of progynon B daily from the eighth to the tenth day after the calculated term. If no labor pains have developed after 100 mgm. have been administered the treatment is discontinued. In these cases there has usually been a miscalculation as to the date of term on the part of the patient.

(BUETTNER). EDITH SCHANCHE MOORE.

PUERPERIUM AND ITS COMPLICATIONS

Sheehan, H. L.: Post-partum Necrosis of the Anterior Lobe of the Pituitary Gland. *Lancet*, 1940, 239: 321.

Ten cases of post-partum necrosis of the anterior lobe of the pituitary gland are reported by Sheehan and added to his 15 cases previously reported as evidence to support the contention that necrosis of the anterior lobe of the pituitary gland is due to collapse of the patient at delivery, usually as a result of severe obstetrical hemorrhage.

Massive necrosis occurred in 2 of the 10 cases. In both cases there was massive puerperal hemorrhage with severe and prolonged collapse, followed by sepsis. In the first case the anterior lobe of the pituitary gland was almost completely necrosed, there being only small amounts of living tissue remaining at the base of the stalk and directly under the capsule. In the second case there was almost complete necrosis and, in addition, marked infection around the periphery.

Four cases showed recent small necroses. Two of the patients had mitral heart disease, and two had had surgical procedures. Hemorrhage was not so

pronounced a factor in the production of collapse in these cases. Death occurred in each case several days after the collapse, and at autopsy small areas of recent necrosis were found in the anterior lobe of the pituitary gland.

Three cases coming to post-mortem examination gave a history of having had severe hemorrhages at previous deliveries. In each of them healed scars were found in the anterior lobe of the pituitary gland, they being evidence of previous necrosis.

The necroses of the anterior lobe of the pituitary gland are due to collapse of patients at delivery, usually because of severe hemorrhage. Other factors, such as heart-disease, toxemia, dystocia, may also result in collapse with the production of necrosis. The incidence and size of the necrosis depend on the gravity of the patient's condition at the delivery. The lesion is not directly fatal, but may produce hypoglycemia; hence, glucose infusions are indicated. A small necrosis is harmless, but if a patient with a large necrosis survives, she develops the syndrome of severe hypopituitarism (Simmonds' disease) subsequently. LUTHER H. WOLFF, M.D.

Pérez, M. L., and Bóigen, I.: Puerperal Recrudescence of an Endocarditis. Gangrene of the Extremities (Reagudización puerperal de una endocarditis. Gangrena de las extremidades). *An. de Inst. de maternidad y asist. social*, 1940, 1: 84.

The authors describe the case of a woman, aged thirty-five years, who except for very marked edema of the lower extremities had a normal pregnancy and labor, but had a slight rise of temperature during the first six days of the puerperium when she left the hospital in spite of advice to the contrary. Four days after her return home, she developed pain in the calf of the left leg and swelling of the entire limb, and eight days later blue patches were found on the dorsum of the foot which gradually turned black. On readmission one month after delivery, the patient was found to have a marked presystolic mitral murmur, with duplication of the second sound, and increase in the size of the heart. The left leg presented a blackish color from the toes up to its lower third, and purple patches and blisters with turbid content higher up to the upper limit of the knee where the skin still had its normal aspect. Palpation of the foot gave the impression that it was mummified. The right leg presented some brown patches and the dorsum of the foot was nearly completely covered by purple patches. The entire left extremity and the right one to above the knee were cold. Injections of acetylcholine during the first three days did not give any results, and no sign of an arterial pulse could be discovered instrumentally in either extremity. Perivascular sympathectomy and exploration of the arteriovenous vessels were decided upon. At operation, a large amount of organized blood clots was removed from the left internal saphenous vein, and organized and recent blood clots were found in the left femoral artery; their extraction was followed by a weak flow of blood. The same intervention was attempted on the right limb, but it was impossible to reëstablish the circulation in the femoral artery. Three days later the left extremity seemed to be improving, but the condition of the right extremity was greatly aggravated. However, after another four days, the gangrene involved both extremities to the same degree and reached beyond the middle of the thighs. Autopsy revealed that the entire aorta was filled with blood clots and that the mitral valve presented old scars and recent vegetations which were easy to detach; organized clots were found in the ventricle and on these were vegetations.

The authors discuss the most common cause of puerperal gangrene of the extremities, which is of arterial or venous origin, but always due to an acute infection. However, they exclude this cause in the present case because of the absence of the violent symptoms which characterize this class of septic puerperal processes. They rejected ergotism, Raynaud's disease, and senile thrombo-arteritis as possible causes and finally considered the cause to be embolism due to an old lesion in the left ventricle or the aorta. These embolisms are rare in mitral stenosis and some aneurysms, but not so rare when, as in the reported case, the primary lesion is covered with fresh vegetations, which reveal the presence of a recent recrudescence of the disorder. The autopsy observations of Alders and others show that recent changes in the endocardium are superimposed on old lesions in a large percentage of patients with cardiac diseases. There is no doubt that the biology of pregnancy and the traumatisms of labor contribute to the recrudescence of old valvular lesions and it is not surprising that the reactivated lesions are capable of giving rise to embolisms which may obstruct vessels and lead to gangrene. Nor is it strange that the phase of recrudescence passes unnoticed as in the present case, because its general symptoms of tachycardia, subfebrile temperature, and anemia are usually slight and not always associated, while auscultatory signs are absent or masked or thought to be due to the old lesion. RICHARD KEMEL, M.D.

MISCELLANEOUS

Duca, A.: Study of a Case of Ectopic Chorio-Epithelioma (Contributo alla conoscenza del corionepitelioma ectopico). *Folia demograph. gynaec.*, 1940, 37: 279.

An ectopic chorio-epithelioma is one that develops in some organ other than the uterus without any primary tumor in the uterus or tubes. Schmorl says that primary ectopic chorio-epitheliomas are really metastases from a chorio-epithelioma that has developed in the placenta and has been expelled *in toto* without having become implanted and developed in the uterus. These ectopic tumors are most frequently found in the vagina or lung, though they have been seen in the ovary, kidney, liver, intestine, choroid, brain, bladder, broad ligament, and rectovaginal septum.

The author describes a case of chorio-epithelioma in the vagina. The patient, a married woman of twenty-four, had been delivered of a normal child at term on April 10, 1939. She was admitted to the hospital on October 24 of the same year for hemorrhage from the uterus. On October 30 the uterus was curetted and the curetted tissue showed normal villi. She was discharged free of hemorrhage and with the cervix closed. She was brought back on December 1 with profuse hemorrhage and acute anemia from loss of blood. Examination quite unexpectedly showed that the hemorrhage was not coming from the uterus but from a small bluish tumor on the anterior wall of the vagina at the boundary between the lower and middle thirds. It was the size of a small cherry, sharply circumscribed, and it projected into the lumen of the vagina. At the most convex point there was an opening from which blood was flowing freely.

The patient was given intravenous injections of glucose solution and stimulants and a few days later when her general condition had improved sufficiently the tumor was excised into sound tissue. Microscopic examination showed typical chorio-epithelioma. Histological pictures are given in the original article. The patient was treated with 30 mgm. of radium applied to the vagina for four successive days and was given 14 injections of human chorionic villi reduced to the stage of ultrapeptones. She was discharged in good condition. Further observation and repeated biological examinations will demonstrate whether the cure is permanent or temporary.

The author discusses the question of whether this chorio-epithelioma developed from the normal pregnancy or from a later abortion and concludes that it probably resulted from the latter.

AUDREY G. MORGAN, M.D.

GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Ferrebee, J. W., Ragan, C., Atchley, D. W., and Loeb, R. F.: Desoxycorticosterone Acetate, Corticosterone, and Cortical Extract in Addison's Disease. *Endocrinology*, 1940, 27: 360.

The writers report observations made upon a well established case of Addison's disease. The study consisted of the comparative effects of desoxycorticosterone acetate, corticosterone, and of cortical extract upon the electrolyte and water metabolism, the carbohydrate metabolism, the protein metabolism, and upon the circulation time. During the study the patient was given 6 mgm. of desoxycorticosterone acetate daily, which had been found to maintain a normal electrolyte pattern in the patient's blood. During separate periods of study the patient was given an additional 20 mgm. of corticosterone for two days, 17.2 mgm. for two days, and 15.5 mgm. for one day. During the last period 7 c.cm. of cortical extract were given three times daily. The studies were done on a metabolism service. The diet was standardized throughout the study.

At the conclusion of each period of observation the blood was examined for the following: sodium, potassium, calcium, magnesium, chloride, bicarbonate, phosphorus, cholesterol, serum protein, and non-protein nitrogen. The glucose tolerance was also determined at the conclusion of each period of study, as were the venous pressure, circulation time, and vital capacity. Blood-pressure determinations were made twice daily. Daily, 24 specimens of urine were analyzed for ammonia and chloride. Aliquots of the daily urine specimens were analyzed after each period for sodium, potassium, and nitrogen.

All three preparations had some effect upon the excretion of sodium and potassium salts. The increased dose of desoxycorticosterone acetate caused a much greater increase in the potassium excretion with a comparable drop in the sodium excretion. None of the preparations had any demonstrable effect upon the nitrogen excretion. In all three studies differences in the carbohydrate metabolism were minimal. There was a very slight rise in the blood sugar in the fasting half-hour and one-hour specimens when the glucose tolerance tests were made after treatment with corticosterone and with cortical extract. The large doses of desoxycorticosterone caused a significant rise in the systolic blood pressure and the venous pressure.

RULON W. RAWSON, M.D.

Rindone, A.: Clinical and Experimental Studies; Treatment of Acquired Hydronephrosis (Criteri clinici e sperimentali nel trattamento della uronefrosi acquisita). *Arch. ital. di urol.*, 1940, 17: 328.

The author presents a case of hydronephrosis secondary to an impacted ureteral calculus in which simple incision and drainage of the ureter with removal of the calculus resulted in the reëstablishment of renal function in a kidney which had been blocked for more than three months. After nine years, function on the involved side was demonstrated to be equal to that on the uninvolved side. Experimental studies are also reported in which ureters were ligated unilaterally in rabbits and dogs by the transperitoneal route, after exteriorization of the bladder had been performed in order to render accessible the lower portions of the ureters. A length of time was allowed to elapse, which varied in the rabbits from five to sixty-two days, in the dogs from five to forty-five days. Twelve dogs were operated upon and the following observations were made:

1. Ligation of the ureter tends to produce a hydronephrosis of moderate degree. If the stasis is allowed to continue up to the twenty-fourth and forty-fifth days of the experiment, respectively, atrophy of the kidney parenchyma occurs.

2. The principal findings in such kidneys consisted of degenerative changes in the tubules and the glomeruli, and proliferation of the interstitial tissue.

3. The reëstablishment of function is possible after fifteen days when the hydronephrosis is not complicated by infection. If such intervenes, however, the parenchymal tissue undergoes in a few days such profound anatomical changes as to render the organ unable to perform its excretory functions.

4. The incidence of infection is fairly high, 37 per cent in the present series.

A second group of animals, consisting of 12 rabbits, was similarly treated. The data obtained in the two groups showed rather marked differences, both anatomical and functional. Whereas in the dog the blocking of the ureter resulted in an atrophic kidney, considerably reduced in volume and mass, in the rabbits there was a voluminous hydronephrosis with extensive dilatation of the ureters, pelvis, and calyces, but little if any atrophy. These differences are attributed by the author to the diversified functions of the kidney in herbivora and carnivora, of which the experimental animals were types.

In the application of these studies to clinical practice objection is raised that the block resulting from ligation of the ureter is abrupt and complete and therefore not strictly comparable to that secondary to an impacted calculus, which is in most cases gradual and incomplete. The effects upon the renal parenchyma are therefore different, as well as the respective capacity for recovery of function. Notwithstanding this objection, evidence is obtained that total or partial return of function may be expected in kidneys obstructed for protracted periods of time, and that the chief indication for removal of the kidney should be a degree of destruction ordinarily caused only by superimposed infection.

EDITH FARNSWORTH, M.D.

Braasch, W. F., and Jacobson, C. E.: Chronic Bilateral Pyelonephritis and Hypertension. *J. Urol.*, 1940, 44: 571.

An analysis of 180 cases of chronic bilateral pyelonephritis revealed an incidence of hypertension in 26.1 per cent, or an increase of 6 per cent over that found in the authors' control group of cases. This increase was particularly prominent among patients with pyelonephritis who were less than fifty years of age; among these patients the incidence of hypertension was found to be almost twice that noted in the control group. The incidence of hypertension among the patients fifty years or more of age was found to be approximately the same in both groups. The comparison of the incidence of hypertension found in identical age groups also revealed a higher incidence of hypertension among those patients who had pyelonephritis than among those making up the control group.

An apparent relationship was found to exist between the incidence of hypertension and the duration of symptoms of pyelonephritis. Although in most cases the incidence of hypertension increased with the duration of symptoms, there were some cases in which the blood pressure remained normal after the pyelonephritis had existed for from fifteen to twenty years.

Apparently there is also a relationship between the degree of pathological change in the kidneys and ureters, as evidenced by the degree of deformity as shown in the urogram and the incidence of hypertension. The highest incidence occurs in those cases in which the pathological changes are found to be most marked.

Impaired renal function does not necessarily imply the presence of hypertension. In fact, the blood pressure was normal in more than half of the cases in which impaired renal function was noted. However, hypertension was found twice as often in patients with impaired renal function as in individuals with normal renal function.

In approximately 75 per cent of our cases of hypertension the systolic blood pressure was less than 180 mm. of mercury, and in only 4 cases was it more than 200 mm. of mercury. Thus, though it appears that pyelonephritis contributes to the incidence of hypertension, the hypertension occurring in these cases is usually of a comparatively benign nature.

The usual types of microörganisms found in infections of the urinary tract were found in the authors' series of cases of pyelonephritis. The incidence of hypertension among the patients affected with aerobacter aerogenes infection may be significant.

Hypertension is occasionally observed in cases of mild or recurrent chronic pyelonephritis in which the renal function is normal and there is no evidence of urographic deformity. From various clinical data, the hypertension appears to be of independent origin and may be termed "essential hypertension."

Ercole, R., and Fort, A.: Anthrax of the Kidney; 2 New Personal Observations (Antrax del riñón: a propósito de dos nuevas observaciones personales). *Rev. argent. de urol.*, 1940, 9: 301.

The authors think that anthrax of the kidney is not as rare as seems to be indicated by the small number of cases reported in the world literature. Since 1934, they have observed 4 cases of this disorder, and during the same period, they have attended to 30 cases of perirenal phlegmon, 5 of which were secondary to this preëxisting renal process and 25 of which belonged to the group of so-called primary perirenal phlegmons; consequently, 16 per cent of the latter were cases of pyonephritis of the anthrax type. The authors describe their 4 cases.

According to Graves and Parkins, the pre-operative diagnosis has been made in only 11 of 67 cases; however, this statement is in direct opposition to the personal experience of the authors, who succeeded in establishing the diagnosis in their 4 cases by means of pyelography. Undoubtedly, pyelography is the best method to determine the presence of the process, as shown by Huguier's series of 39 cases; in 25, or 64 per cent, the method provided positive diagnostic data; in 11, or 28 per cent, the pyelogram was normal; and in 3 it did not allow definite conclusions. In general, the pyelogram of anthrax is so similar to that of renal tumor that confusion may arise, especially in cases of febrile cancer of the kidney. The anomalies observed in Huguier's series included compression of the small calyces, displacement of a large calyx or of a ureter, enlargement or constriction of the calyx, enlargement with constriction of the calyx, or partially lacunary calyx. In addition, the filling of necrosed or softened zones may simulate caverns. There were filling defects in 2 of the authors' cases and displacement of the upper and lower large calyces in another case.

Renal anthrax develops only exceptionally toward the cavities of the kidney; it has a tendency to infect the perirenal tissue, and give rise to a perirenal phlegmon which is the complication by which the anthrax manifests itself clinically in a large number of cases. Patients without this complication present more or less evident signs of general infection associated with symptomatic pain in the lumbar region. As a rule, the patient gives a history of infection one or two months previously, such as a furuncle, an anthrax, or a whitlow. Urine examination is usually negative with regard to the presence of pus; this is natural, when one considers the typical evolution of the process. Excretion pyelography is indicated in every case of perirenal phlegmon; even a negative picture is of diagnostic value. In case of doubt, ascending pyelography should be done.

The treatment of renal anthrax is surgical and the type of operation will depend on the localization of the process and the amount of intact renal parenchyma; nephrectomy is indicated when the anthrax involves a large part of the parenchyma or is located deeply in the body of the kidney; otherwise, the

intervention will be conservative. Operative difficulties will depend on the degree of sclerosis of the perirenal tissue, the sclerosis increasing proportionately to the time during which the anthrax has been present or to the time elapsed between the beginning of the drainage of the perirenal abscess and the intervention on the kidney in case of secondary nephrectomy. The operative mortality was 10 per cent in 50 cases of primary nephrectomy of one series, but rose to 50 per cent in 8 cases of secondary nephrectomy of another series. There was no operative mortality in the 3 cases of the authors in which nephrectomy was performed; 2 of these were secondary nephrectomies.

Among the conservative interventions may be cited decapsulation and drainage, drainage and thermocauterization or curettage of the lesion, nephrotomy, partial nephrectomy, and enucleation of the anthrax. Drainage following decapsulation or thermocauterization is indicated only in cases in which the anthrax tends to form an abscess, provided it does not justify more radical treatment. Enucleation of the process and partial nephrectomy are ideal interventions in conservative treatment, all the more so as it is possible to find a cleavage plane between the anthrax and the healthy renal tissue which allows enucleation of the lesion with the finger.

RICHARD KEMEL, M.D.

Capacci, P.: Errors of Interpretation in Retrograde Pyelography for the Diagnosis of Renal Tumors (Errori d'interpretazione della pielografia ascendente nella diagnosi dei tumori renali). *Arch. ital. di urol.*, 1940, 17: 284.

The retrograde pyelogram is generally conceded to be the most valuable procedure for the diagnosis of renal tumors, especially when the classical syndrome of pain, hematuria, and palpable tumor is not yet present. Even by this method, however, errors occur which may be due to the following two possibilities: (1) the pyelogram may appear normal although the kidney may contain a neoplasm; and (2) the pyelogram may show a deformity characteristic of malignancy in a kidney which contains no trace of neoplastic change. The conditions which are capable of altering the endorenal contours are: (1) change of the function and morphology by direct or reflex effect upon the nervous or muscular elements; (2) mechanical factors inside or outside of the urinary tract, or (3) congenital deformities, which may result in abnormal roentgenograms. In the first category belong those dyscinesias resulting from imperfect synergism between the extrinsic and the intrinsic innervations of the urinary tract which are chiefly characterized by spasm, atonia, or dilatation.

Six cases are reported in which the condition began suddenly with abundant and persistent hematuria unaccompanied by bladder symptoms. By means of the cystoscopic examination, the lesion was found to be unilateral and localized in the upper urinary tract. The retrograde pyelogram showed definite changes in the renal pelvis. On the basis of these data, the diagnosis of tumor was manifestly the first to be ruled out, and surgical exploration was done. In each of the 6 cases a neoplasm was excluded. How, then, were the morphological changes found in the urogram to be accounted for? The connection existing between the so-called pyelo-ureteral dyscinesia and hemorrhagic nephritis is presumptive, attention having been directed along those channels since the work of Fuchs in 1925. This author demonstrated the ease with which even a minimal inflammatory process, in attacking the fornix of one of the calyces, could cause the development and rupture of large venous trunks and precipitate hematuria. That the x-ray profile could be thus altered by small clots soon became evident; it remained for Hinman to show that such foci in the fornices could appear as a result of stasis or other functional disturbances.

In a second group of cases, the author presents examples of mechanical factors which alter the contours of the urinary tract. Such factors may be extrinsic or intrinsic; they include intra-abdominal tumors as well as pararenal or retroperitoneal tumors. A case is here reported in which macroscopic hematuria was never present and the patient complained only of lumbar pain with radiation to the gluteal region of the same side, and intense nocturnal exacerbations. A fixed mass was palpated in the region of the left kidney which was tympanitic to percussion. The urine contained many leucocytes, with hyaline and granular casts. The intravenous pyelogram showed a deformed left pelvis, the lower part of which was entirely obliterated. Retrograde urography pointed to the diagnosis of a renal tumor, and only a most searching revision of the evidence led finally to the diagnosis of an extrarenal, retroperitoneal neoplasm. Another case is reported which illustrates errors arising from the presence of a blood clot in the pelvis of the kidney which prevents the normal filling and produces the appearance of a deformity on the x-ray film.

In the third group are placed those alterations in the endorenal cavity which are associated with congenital malformations. Here again the differential diagnosis is difficult, and even the most discerning roentgenologist may not be able to rule out a renal tumor. In such cases exploratory surgery, in the opinion of the author, is indicated.

EDITH FARNSWORTH, M.D.

Kozoll, D. D., and Kirshbaum, J. D.: The Relationship of Benign and Malignant Hypernephroid Tumors of the Kidney. Clinical and Pathological Study of 77 Cases in 12,885 Necropsies. *J. Urol.*, 1940, 44: 435.

Thirty-three cases of hypernephroid adenoma (or so-called benign hypernephroma) are reported, all of which were incidental post-mortem findings. These tumors showed a marked predilection to occur in white males of an average age of sixty and nine-tenths years. Six of these benign growths occurred simultaneously with an unrelated type of malignant tumor. The tumor was usually smaller

than 5 cm. in greatest diameter, and although it involved either kidney with about the same frequency, in the right kidney the lower pole was most frequently involved, and in the left kidney the upper pole was most frequently involved.

The existence of multiple histological types and structures, even in the benign hypernephroma, is emphasized. Instances of glandular structures being present in the same section as the more common alveoli of polyhedral "clear" cells are cited as proof that the concept of a hypernephroma need be broadened.

Forty-four cases of hypernephroid carcinoma (so-called malignant hypernephroma) are presented. There was a predilection for the white male, the average age being fifty-eight and four-tenths years. The classical triad of symptoms of pain, hematuria, and a mass, were present in less than 50 per cent of these patients, despite the fact that most of them entered in a terminal state. In 6 of the 44 cases the carcinoma was an incidental post-mortem finding; the malignant characteristics were obvious on gross examination. Another 6 cases, which appeared to be benign on gross inspection, subsequently proved to be malignant, as evidenced by the invasion of the capsule and adjoining renal parenchyma, and the presence of tumor thrombi in the arcuate veins near the renal cortex. These changes were interpreted as the earliest evidences of malignant transformation. This experience has led to the conclusion that a hypernephroma, regardless of size, can be considered benign only after metastases and invasion have been excluded.

The still greater frequency of multiple histological types and structures in the hypernephroid carcinoma and its metastases is of particular interest. So-called "sarcomatous" tendencies, multinucleated giant cells, and atypical mitoses were strikingly frequent. The relatively short clinical course in patients with a hypernephroid carcinoma belies the period of its pathogenic development. D. E. MURRAY, M.D.

Harrill, H. C.: Retrocaval Ureter. Report of a Case with Operative Correction of the Defect. *J. Urol.*, 1940, 44: 450.

This article describes a case of suspected retrocaval ureter in which the diagnosis was confirmed at operation and the defect corrected.

A forty-six-year-old male was hospitalized for cardiac failure with a blood pressure of 200 systolic and 132 diastolic. The urine continued to contain considerable amounts of albumin as well as red and white blood cells. Stereobilateral retrograde pyelograms revealed a small left kidney and a hydronephrotic right kidney with an elongated pelvis. From the ureteropelvic junction the right ureter was seen to curve upward in a wide arc toward the midline, then downward toward the right side, after which it continued in a normal course. It was decided to correct the hydronephrosis on the right side in an attempt to improve the function before removal of the poorly functioning left kidney.

The kidney was exposed through a long curved lumbar incision and a large, dilated, elongated pelvis was found projecting below the lower pole. The pelvis extended to the level of the third lumbar vertebra where it joined the ureter at an obtuse angle. From this point the ureter coursed downward and inward and disappeared behind the vena cava. It was seen to reappear 1 cm. lower on the medial side of the vena cava still coursing downward, crossing the right common iliac artery and disappearing over the brim of the pelvis. An incision was made above the ureteropelvic junction, the ureter was drawn out from behind the vena cava, and an anastomosis was made around a No. 12-F rubber catheter. The catheter was then removed and the pelvis drained and incision closed.

An intravenous urogram taken three months later revealed reduction in the size of the hydronephrosis. At seven months, a retrograde pyelogram revealed almost no hydronephrosis and no evidence of stricture at the site of anastomosis.

JOHN A. LOEF, M.D.

BLADDER, URETHRA, AND PENIS

Dees, J. E.: Vesical Diverticulectomy. *J. Urol.*, 1940, 44: 466.

The author reviews 95 cases of vesical diverticulectomy from the Brady Urological Institute.

Only 7 patients were under forty years of age, the youngest being ten years old.

The outstanding symptoms were characteristic of obstruction of the vesical neck. Only 17 patients denied symptoms of obstruction and in only 6 of these was definite obstruction not found on cystoscopy. There was a history of complete retention of urine in 26 cases. Symptoms of bladder irritation due to infection were found in 24 cases, hematuria in 22 cases. In 9 patients a bladder tumor was present, and 1 had a vesical calculus.

The urine was uninfected in only 7 patients. There was no residual urine in 8 instances.

Either contracture of the vesical orifice or median-bar formation was found to be the cause of obstruction in 49 cases. There were no patients with large benign hypertrophy of the prostate. Obstruction was due to urethral stricture in 2 cases, to prostatic carcinoma in 1 case, and to a congenital fold of mucosa at the vesical orifice in 1.

There were 195 diverticula present in the bladders of 95 patients. In 4 cases, 1 ureteral orifice lay within the diverticulum and in 3, both ureteral orifices were involved. The number of diverticula in an individual varied from one to eight.

In 79 cases the diverticulum was operated upon transvesically. The usual technique employed consisted of extraperitoneal exposure of the bladder, which was then opened and the diverticular orifice exposed. This opening was circumcised and a line of cleavage established between the layers of the sac wall. The lining mucous membrane and the innermost layers of the sac wall were removed. The

cavity left behind was drained extravesically and the defect closed with one or more layers of continuous sutures. A large de Pezzer catheter was introduced into the bladder for drainage.

In 16 cases the technique employed was eversion of the sac by suction through a glass tube.

In 2 cases the diverticulum was removed extravesically. In 8 patients the bladder was opened anteriorly and its wall divided down to the orifice of the diverticulum. The orifice was then circumcised and the diverticulum removed extravesically.

In 4 cases the bladder was opened anteriorly without further dissection and the diverticulum removed extravesically.

Wound infections and prolonged urinary drainage occurred frequently. Epididymitis, phlebitis, pyelonephritis, and bacteriemia were the other most common complications. Eight patients died before leaving the hospital, death in 5 being due to pyelonephritis and uremia.

In 50 per cent of the cases, urinary drainage continued for more than forty days. Persistent prostatic obstruction was a relatively frequent cause.

Symptomatic and functional results were excellent in 55 cases, good in 15 cases, fair in 12 cases, and poor in 5 cases. JOHN A. LOFE, M.D.

GENITAL ORGANS

Roebbelen, A.: The Present Stand of the Treatment of Prostatic Hypertrophy (Der heutige Stand der Behandlung der Prostatahypertrophie). *Fortschr. d. Therap.*, 1939, 15: 195.

In 1931, Butenandt was able to produce the male active substance in a chemically pure form from the urine of young males. He called this extract androsterone, In 1935, Laqueur was able to isolate a chemically pure hormone from the steer testicle in crystal form—testosterone.

In regard to the origin of prostatic hypertrophy, the opinion that it is a neoplasm, a fibromyoadenoma, has prevailed. The para-urethral glands are affected by the proliferation. Loeselcka and Adrion divide the prostate into outer and inner glands. The latter is a group of glands, which is embedded in the musculature of the internal vesical sphincter. These are joined by the para-urethral glands up to the urethra. The outer gland atrophies from the pressure of the proliferating masses, and from it the so-called surgical capsule develops. According to Adrion, the vascular supply of both of the glandular portions is important. While the internal prostatic artery, which supplies the inner gland, has abundant anastomoses with the vesicourethral artery, as a result of which an ampler blood supply of the inner gland is provided in arteriosclerosis of the prostatic artery, this is not the case with the external prostatic artery. The causes of prostatic hypertrophy are the arteriosclerosis, in addition to endocrine processes, especially the production of gonadotropic hormones of the anterior lobe of the pituitary gland (prolan and gonadostimulin B). The development of the prostatic hypertrophy is then caused by a disturbed quantitative relationship between female and male hormones in the sense that in advanced age the female hormone overbalances the male hormone.

According to the author, this explains the manner of action of the hormonal treatment of prostatic hypertrophy. The reports of the different authors on this subject especially are contradictory. Results are achieved even with the female hormone. It is certain, however, that the hormones are generally stimulating and increase the tonus of the bladder musculature. Veil and Lippross found a distinctly increased pressure of the urinary stream following the administration of testoviron. This method of treatment was carried out at the Konjetzny Clinic after resections of the prostate, in cases in which freedom from residual urine could not be achieved in spite of complete removal of the obstructive passage, detrusor weakness being present.

Hormone therapy is also to be considered in the first stage of prostatic hypertrophy, as long as the patients are free from residual urine, for the relief of dysuria and nycturia. A specific effect of the hormones upon the enlarged human prostate gland has not been definitely proved according to the author. If the patient is seen in the second stage with from 100 to 200 c.cm. of residual urine, prostatectomy, that is, enucleation of the adenoma, should be done. Under all circumstances, sufficient renal function is demanded: the excretion of dyes by the kidneys, the effete matter in the blood (the residual nitrogen of the blood should not amount to more than 40 mgm.), the urinary excretion and concentration, and the blood pressure should be determined and an electrocardiogram to reveal the cardiac and circulatory conditions should be made.

According to the author, the method of removal is of no decisive importance in the curative result. The suprapubic method is preferred at the Konjetzny Clinic; their mortality amounted to 10 per cent in 50 cases. The perineal method has the disadvantage of fistula formation or incontinence, while the suprapubic enucleation has the danger of hemorrhage. In all cases with non-intact cardiac and renal activity, the transurethral resection of the prostate is indicated. It was carried out in 100 cases, and only in 11 of 80 benign prostatic enlargements was there an isolated enlargement of the middle lobe. A prerequisite for the electroresection is the possibility of introducing the resectoscope into the urethra. Here also a careful investigation of the renal function is necessary, just as in enucleation. The two-stage operation was often done, as considerably less hemorrhage is encountered at the second operation than at the first. In addition to the bleeding of the operation late hemorrhages from the casting off of coagulated eschars also may occur. The mortality was 5 per cent. Of the patients who were treated by resection 79 per cent showed improvement in their condition, and 2 showed no change. At any rate, the majority of the patients can be saved from the for-

mation of a bladder fistula or the need of a catheter for the rest of their lives by electroresection.

(GEBELE). LOUIS NEUWELT, M.D.

Vest, S. A.: Perineal Prostatectomy. *Surgery*, 1940, 8: 798.

The author describes a modification of the technique of closure of perineal prostatectomy as follows:

Routine perineal prostatectomy, according to the technique described by Young, has been carried out and needs no reiteration here. It should be emphasized, however, that, in order to facilitate the proper use of the sutures, the surface of the prostatic capsule should have adequate exposure and the inverted V-incision should be slightly wider and larger than usual. This makes the placing of the sutures, to be described, less difficult. Figure 1 shows the various steps the author has found advisable in cases in which there seems to be an unusual amount of vascularity at the vesical orifice in order that postoperative hemorrhage may be kept at a minimum or entirely controlled. *1* shows the prostatic cavity immediately following throrough removal of a large adenoma. The vesical orifice is pulled well into view by two long tenaculums which have grasped it anteriorly and posteriorly. The adenoma has been cleanly cut from the vesical orifice and posterior urethra by means of scissors.

By means of a boomerang needle, the long double suture of No. 1 plain catgut has been pulled through the vesical orifice in the region of 2:00 o'clock. This suture is shown with Young's boomerang needle

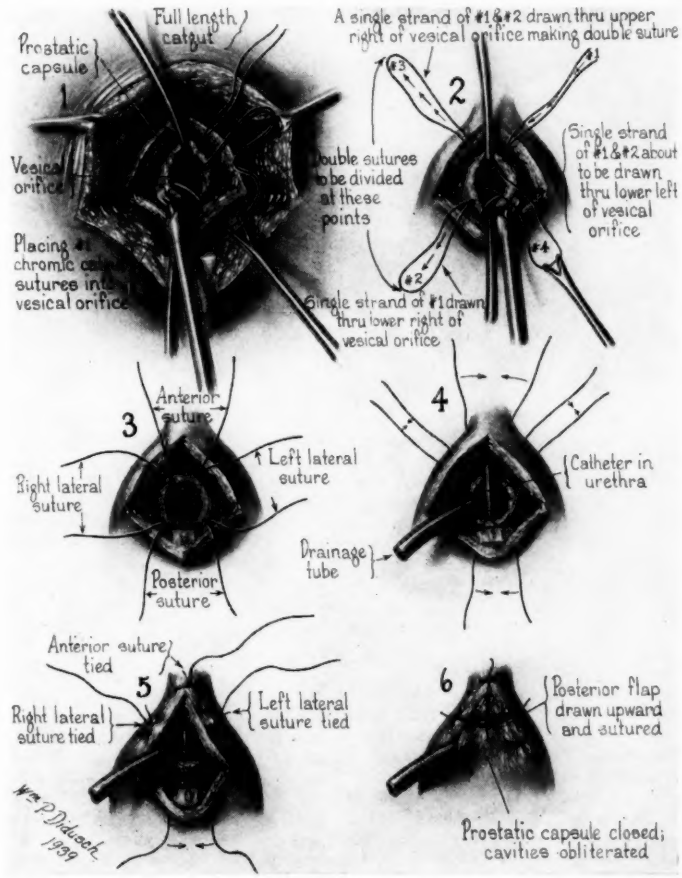


Fig. 1. Technique of reconstructing the vesical orifice to eliminate hemorrhage following removal of benign prostatic hypertrophy.

just before it is grasped and pulled through the vesical orifice in the region of 8:00 o'clock. These sutures are taken rather deeply into the vesical orifice so that they will include any retracted open vessels that might be on the bladder side. The placing of this suture may be awkward sometimes because a complete length of catgut, even though doubled, is not quite long enough. This can be remedied by tying two lengths together before beginning the procedure.

In *2* the double suture has now been pulled through the vesical orifice both in the region of 10:00 and of 8:00 o'clock, following which a single strand of the double suture which transverses the vesical orifice has been grasped and pulled through the vesical margin in the region of 10:00 o'clock and the boomerang needle is shown in the act of pulling the remaining strand across the vesical orifice through the margin in the region of 4:00 o'clock, following which the sutures are divided at the points labelled *2*, *3*, and *4*.

The situation after these sutures have been cut is shown in Figure 1 *3*. There are shown four individual sutures at the vesical orifice which are indicated as anterior, posterior, and right and left lateral. As will be seen in *3*, each strand of the left lateral suture, for example, goes through the same needle hole in the vesical orifice as the adjacent anterior and posterior suture, so that no vesical orifice margin is left between in which a spurting artery might exist. The four sutures, therefore, include the entire 360 degrees of vesical orifice.

In *4* these four sutures have been pulled through the corresponding areas in the prostatic capsule, following which a urethral catheter and a small perineal drainage tube are shown in place. It will be noted that the anterior suture has been placed far anteriorly in the prostatic capsule so that when it is tied the anterior lip of the vesical orifice is pulled down on the anterior surface of the catheter and the anterior margin of the vesical orifice will then very closely approximate that of the divided urethra. The portion of the prostatic cavity where the anterior prostatic commissure and urethra once existed is thus obliterated.

The lateral sutures are next tied as shown in *5*. The last procedure is to tie the posterior suture which ligates the ejaculatory ducts. After the sutures have been tied, a single strand of each is divided as shown in *5*.

In *6* it can be seen that the single strand of posterior suture has been tied to the anterior and the two laterals have been tied across the midline. The tying of the posterior to the anterior has carried forward the tip of the inverted flap and reapproximated it into its original position with the tube coming out one of the limbs. Sometimes a small single suture is placed on the opposite side of the V as shown in *6* to close completely the prostatic capsule except at the point where the tube emerges.

With this type of closure the vesical orifice is thoroughly circumscribed in its 360 degrees and is pulled down into the cavity of the prostatic capsule, very near to the stump of the membraneous urethra. This tends to produce early obliteration of the prostatic capsule and leaves only a very short bridge for the regenerating mucosa of the vesical orific toe traverse before it meets the mucosa of the membraneous urethra. The perineal tube is withdrawn at the end of twenty-four or forty-eight hours according to whether or not perineal drainage is necessary because of infection.

The remainder of the perineal wound is closed according to the usual technique, which consists of pulling the levator ani muscles together with plain catgut and suturing the perineal skin with interrupted waxed silk or catgut sutures.

JOHN A. LOEF, M.D.

Bendandi, G., and D'Agostino, M.: Spermatocele (Spermatocele). *Clin. chir.*, 1940, 16: 341.

The authors cite the 93 cases of spermatocele gathered by Whitney in 1907 and add 82 cases reported since that date, of which 10 came under their personal observation.

The tumor may appear at any age after the establishment of spermatogenesis, but is far more frequently encountered in the second half of life. Etiological factors commonly incriminated are trauma, infection (either gonococcal or non-specific), and prolonged sexual abstinence associated with frequent stimulation. The theories of pathogenesis commonly advanced are:

1. Neoformation.
2. Derivation of the cyst from residues of the wolffian body.
3. Formation from spaces due to failure of fusion of the tunica vaginalis testis.
4. Dilatation and retention either in the paradidymis or ducts.

Of these theoretical origins, that of the wolffian body and that of dilatation and retention in the ejaculatory passages have obtained most support. The cysts may be intravaginal or extravaginal, the latter often becoming extremely large, while the former may be multilocular but for the most part smaller. The walls are ordinarily thin but tough, and composed of a layer of connective tissue covered with an endothelial layer. Smooth muscle fibers are also found in the arealor tissue, which represent the attenuated elements of the displaced layer surrounding the efferent ducts. The contained liquid is generally opalescent and milky because of the presence of spermatozoa. If allowed to stand, it separates into two layers, the upper one clear, the lower dense and creamy. If sperm are absent the liquid may be clear and yellowish. This fluid may be differentiated from that found in hydroceles by the reaction which is neutral or slightly alkaline, a low specific gravity which varies from 1.002 to 1.009, the low albumin content rarely exceeding 0.60 gm. per cent, and a mineral content varying between 0.78 and 0.88 gm. per cent.

The symptomatology of this condition may be that of an endoscrotal mass or a sensation of weight

and tension of the involved testicle, or symptoms may be entirely absent and the tumor may have escaped the attention of the patient. On examination the testicle is found to be independent of the cyst with the lower pole of which it is in contact. Transillumination is of scant usefulness because the tumor may prove to be translucent or opaque. Conditions to be differentiated from spermatocele are hydrocele, hematocele, chylocele, and tumors of the epididymis and testicle. Aspiration may be resorted to if necessary to establish the diagnosis. The uniform consistency, (soft or tense), fluctuation (which, however, is not invariably present), and the slow and progressive growth exclude neoplasms as well as tuberculosis of the epididymis. The prognosis is excellent, and malignant degeneration has never been reported.

Treatment consists of radical excision of the cyst, which is easily accomplished under local anesthesia. If the testicle is atrophic or the patient aged, the testicle should be removed as well.

EDITH FARNSWORTH, M.D.

Hunt, R. W.: Ectopic Testis; Report of a Case of Bilateral Ectopia Testis Pelvicis and Its Surgical Correction. *J. Urol.*, 1940, 44: 325.

A case of bilateral ectopia testis pelvicis is presented and a brief discussion of the etiology, diagnosis, and surgical correction is made by the author. The conclusion is drawn that the intra-abdominal ectopic testis can be diagnosed only by exploratory operation. This is best done in the fourteenth year, because if the testicle is going to descend spontaneously it will in the majority of cases have done so

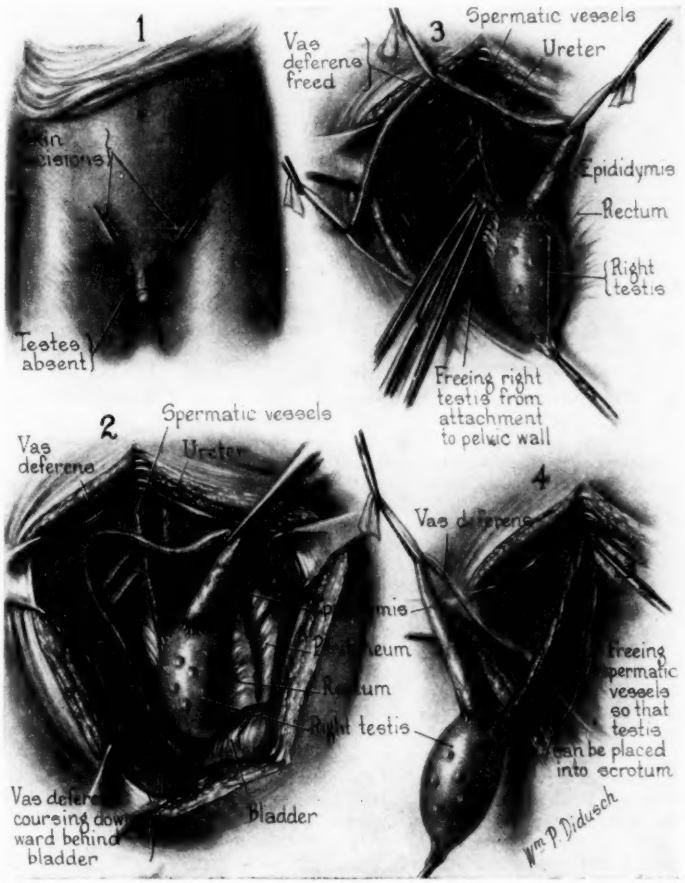


Fig. 1. *1*, Skin incisions; *2*, original location and attachments of right testis; *3*, freeing attachment to testis; *4*, freeing spermatic vessels.

1
Wm. P. Didusch
Right testis, epididymis, vas deferens and spermatic vessels freed and ready to be placed into scrotum
Needle with suture material attached to gubernaculum testis piercing skin of scrotum
Suture of wound
2
Right testis placed into scrotum
Placing suture attached to gubernaculum testis in skin of leg to hold testis in scrotum

Fig. 2. *1*, Method of anchoring testis in scrotum; *2*, testis is maintained in scrotum by attaching suture to thigh.

at or before this age whether or not the patient has had hormonal treatment. D. E. MURRAY, M.D.

Melicow, M. M.: Embryoma of the Testis. *J. Urol.*, 1940, 44: 333.

The author presents an unusual testicular tumor throughout which were distributed masses of syncytial cells resembling those of the chorionic epithelium seen in pregnancy. This finding plus intense chorionic reaction and gynecomastia supported the conclusion that he was dealing with a tumor in a male containing numerous embryos in various stages of development. Those of the blastula stage were the earliest ever seen in a human being.

An attempt made by the author to explain the findings on the basis of pathological embryology suggested a comprehensive classification of testicular tumors in general and this is presented.

D. E. MURRAY, M.D.

Dreyfuss, M. L., and Lubash, S.: A Contribution on Malignant Mixed Tumor of the Spermatic Cord (Lipo-Osteofibro-sarcoma). *J. Urol.*, 1940, 44: 314.

An unusual tumor of the spermatic cord, a lipo-osteofibrosarcoma is presented by the authors. The original tumor had been present for fourteen years and was first noticed as a firm, pea-sized nodule in the left scrotum. Within two months following an apparently complete removal, the patient was re-operated upon for a recurrent tumor mass. Pathological diagnosis revealed a malignant lipo-osteofibrosarcoma of the spermatic cord, and the authors point out that the mixed sarcomas of the spermatic cord do not follow a clinical course which is different from that of ordinary sarcomas.

D. E. MURRAY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Ferguson, A. B.: The Treatment of Osteogenic Sarcoma. *J. Bone & Joint Surg.*, 1940, 22: 916.

This article is the author's second one on this subject and presents further indications that early amputation is not the best treatment of osteogenic sarcoma. It analyzes cases seen within two months of the onset of symptoms to show that lack of haste in amputating improves the results.

Early amputation is that done before the seventh calendar month after the onset of symptoms.

Survivors are defined as patients alive more than five years after the last treatment of the local lesion with no evidence of tumor at the last report.

The cases studied are the first 400 of undisputed osteogenic sarcoma which furnished the necessary data for tabulation, recorded in the Registry of Bone Sarcoma of the American College of Surgeons.

The favorable results obtained at various clinics or hospitals registering 10 or more cases included in this series appeared to be proportionate to the lack of haste in amputating.

Males and females had similar survival rates with each of the various types of treatment which indicated that the disease was equally malignant in the two sexes. Females were treated without amputation more often, and by early amputation less often than the males without a higher death rate ensuing.

Early amputation was used more frequently in cases registered in later years than in those registered in the earlier years. The increase in early amputations was not accompanied by an increase in survivors. The campaign for earlier amputations resulted in an increase in very early amputations among the early amputations in the later periods of the Registry. Early amputations increased approximately 50 per cent and very early amputations approximately 100 per cent, but the survivors of early amputations decreased from 11.6 per cent to 2.5 per cent.

Amputation without previous radiation yielded poor results in the cases seen early after the onset of symptoms.

In 82 cases seen within two months of the onset of symptoms and treated by amputation, neither age, site, variation in treatment, nor degree of malignancy estimated histologically explains the fact that the earlier amputations had the poorer results.

In no case did the patient survive amputation in the first month after the onset of symptoms.

In no case did the patient survive early amputation if between the ages of one and ten or if more than twenty.

No patient survived early amputation if the lesion was not at the distal portion of the femur or the proximal portion of the tibia.

The advocates of early amputation in osteogenic sarcoma of an extremity may persist in amputating as early as the third month after the onset of symptoms if the patient is between eleven and twenty years of age and has a lesion at the distal portion of the femur or the proximal portion of the tibia. In any other instance they can offer no tangible hope of success and should therefore agree to delay of amputation which does offer hope of success.

During the delay the best treatment is undetermined but the following are recommended:

1. Radiation
2. Excision and radiation
3. Excision and implantation of bone graft or chips, with or without radiation

If excision is used, it should be repeated if recurrence becomes evident before amputation is performed. The interval between the last excision and amputation should not be less than three weeks and should probably not exceed two months.

The optimum time for amputation is a quiet period in the course of the disease—a period when the patient is not losing weight, when the blood phosphatase is not elevated, and when there has been no sudden or marked increase of mass or destruction demonstrable roentgenographically.

PAUL C. COLONNA, M.D.

Palma, E. C.: Shoulder Sprains with Lesions of the Coracoclavicular Ligaments (Esguince del hombro por lesión de los ligamentos córaco-claviculares). *Bol. Soc. de cirug. de Montevideo*, 1940, 11: 33.

The author describes in detail the clinical manifestations of shoulder sprains with lesions of the coracoclavicular ligaments and points out the great similarity to fracture in the external third of the clavicle without displacement. In 3 of such cases the author noted the same history of sudden pain in the shoulder and loss of function interfering with work; even very small movements at the shoulder joint were impossible. There was pain on palpation of the shoulder joint in the region of the external third of the clavicle. Pain was most pronounced on abduction of the arm, and less on anterior motion. Movements of circumduction were impossible. Roentgen-ray examination in all 3 cases showed no changes in articular relations, and no fractures. The most painful point on palpation of the shoulder was over the coracoid process. The acromioclavicular articulation showed no signs of luxation. The course of the condition in these patients was favorable although pain and disturbed function lasted for some time. The author explains all of the symptoms by the trauma to the coracoclavicular ligament.

The author presents a detailed clinical report of an automobile injury to the left shoulder sustained by a twenty-eight-year-old man. There was immediate intense pain, and loss of motion in the injured shoulder.

No swelling, infiltration, or deformity was noted. On palpation of the shoulder joint most pain occurred in the external third of the clavicle, especially in the infraclavicular fossa. Roentgen-ray study sixteen hours after the injury showed no fracture or dislocation. The author injected 28 c.cm. of ½ per cent novocaine in and around the insertion of the coracoclavicular ligament. There was immediate cessation of pain and restoration of motion. There was rapid functional recovery after this.

This syndrome of trauma to the coracoclavicular ligaments has hitherto received scant attention in the literature, which has emphasized chiefly acromioclavicular lesions. The author notes that the coracoclavicular ligaments are more important for the stability and movement of the scapula and clavicle than the acromioclavicular ligaments. He quotes Liberson who reported 36 such cases and who notes that the coracoclavicular ligament is more important than the acromioclavicular ligament for the function and stability of the shoulder joint.

The treatment depends on the severity of the process. Immobilization and elevation of the arm by a bandage temporarily relieves the patient by relaxing tension on the ligament. Leriche's treatment by infiltration with novocaine gives excellent symptomatic and functional results. In cases with severe tears of the coracoclavicular ligament surgical repair may be necessary. Some authors maintain that even in acromioclavicular luxations surgical repair of the coracoclavicular ligaments is most important for a successful result. JACOB E. KLEIN, M.D.

Koestler, J.: Experimental Studies of Nutritional Disturbances of the Menisci (Experimentelle Versuche ueber Ernaehrungsstoerungen der Menisken). *Arch. f. klin. Chir.*, 1940, 199: 49.

Meniscus injuries may be divided into two large groups: the acute, traumatic lesions, and the chronic injuries, such as occur in occupational disease, in which a previous trauma cannot be demonstrated. The causes of recognized pathologico-anatomical changes in the menisci are easily demonstrated in the first group; a direct or indirect force may act to produce uncoördinated knee-joint motion which, by exceeding the limit of elasticity, leads to tearing of the meniscal tissues. However, it is more difficult to explain the often purely degenerative changes as seen in the second group; very often grossly visible intrinsic lesions are lacking in this respect.

A study of the blood supply of the meniscus is of vital importance for an understanding of the development of these chronic lesions. According to experimental investigations of the author, blood vessels which branch off from the knee-joint arteries pass radially from the joint capsule into the entire perimeter of the meniscus. However, they supply only the peripheral portions of the fibrocartilage; the inner, central portion is avascular and is nourished by diffusion from the synovia. In certain occupations in which meniscal damage is seen frequently, work is performed in an extreme squatting position, whereby the meniscus is compressed and its blood supply probably embarrassed.

In order to determine the rôle which each factor—blood and synovia—played in the nutrition of the meniscus, the author made the following studies on dogs:

He ligated the afferent vessels to the medial meniscus so that the blood supply was practically obliterated; nourishment could then come from the synovial fluid only. The animals were killed after two, seven, and fourteen weeks. Abnormal changes were found only in the last group, and then in only 2 of the 3 dogs. Widespread degeneration was observed in the tissue of the meniscus with fissures and separation of the fibers, as well as necrotic foci. The lateral meniscus with its undisturbed blood supply remained completely intact.

The author believes on the basis of the foregoing proof—although admitting the doubt which might arise from the use of so few experimental animals—that synovial fluid and lymph are not enough to guarantee the nutrition of the meniscus. Disturbance of the blood supply leads to degeneration not only in the vascular, but also in the avascular zone; it also leads to necrobiosis of the tissues, without an antecedent traumatic separation of the tissues. Meniscus lesions in the knee joint lead also to capsular redundancy and to hypermobility of the meniscus; they predispose to disturbance of the nutrition, which may produce meniscal damage. If at operation one ligates the nutrient vessels to the meniscus, the fibrocartilage must be resected, even though it be found in an undamaged condition.

(G. BEYER). JEROME G. FINDER, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

De Araujo, A.: Autoplastic Articular Reconstruction of the Balancing Elbow (Reconstituição articular autoplastica do cotovello baloiçante). *Rev. brasil. de orthop. e traumatol.*, 1940, 2: 3.

De Araujo discusses the treatment of traumatic lesions of the elbow, complicated or not by suppurating arthritis, and tries to demonstrate the great advantages of subperiosteal resection over arthrotomy. The relatively high percentage of balancing elbows following resection does not decrease the value of the method, as various factors may have influenced the result, such as the extension, nature, and gravity of the lesion; copious suppuration; faulty performance of the surgical act, both tactically as well as technically; and postoperative neglect. In addition, it is not uncommon for a balancing elbow to represent the result of an opportune resection which has avoided the misfortune of an amputation. On the other hand, it should not be forgotten that even arthrotomy and the simple cleaning out of the site of the lesions may result in a balancing elbow.

The author discusses the orthopedic surgical methods and their respective indications in the treatment of the disorder: physical therapeutic

measures, massage, exercises to promote functional re-education, orthopedic apparatus, and the most varied surgical interventions, such as capsulorrhaphy, myoplasty, osteosynthesis, arthroplasty. Invariably he uses physical therapy, even as a preoperative means to prevent undesirable sequelæ, and he has always obtained excellent results in cases of semibalancing elbows. In true balancing elbows, he studies the problem of the apparatus needed, that of arthroplastic reconstruction, and that of ankylosis, and he shows that an ankylosis in semipronation and extension of 110 degrees constitutes an appreciated therapeutic solution because it allows the patient to make good use of his extremity.

Of the 11 cases of balancing elbow which he has treated, 10 were due to traumatic lesions and 1 was the result of a resection for tuberculous arthritis. Two were treated with complete success by physical therapeutic measures; 2 showed considerable improvement after the patients refused to submit to a proposed plastic operation; 2 were subjected to a capsuloligamentous reconstruction, with excellent results in one and satisfying results in the other. In 1 case amputation was indicated because of the gravity of the trophic disturbances; in 2, osteosynthesis was performed with kangaroo tendon and good bony ankylosis was obtained; in another, osteosynthesis was done with a bone graft. In the remaining case, which is described in detail, the author performed an articular autoplastic reconstruction; his technique has allowed him to create a new humero-antibrachial joint having as a posterior point of support a bony protuberance established above a depression excavated on the anterior aspect of the humerus. The good results of this intervention have persisted for four years and the patient has developed a stable and highly efficient elbow in the meantime.

RICHARD KEMEL, M.D.

Burman, M. S.: Vitallium-Cap Arthroplasty of the Metacarpophalangeal and Interphalangeal Joints of the Fingers. *Bull. Hosp. for Joint Dis.*, 1940, 1: 79.

In arthroplasty operations of the small joints of the hand or digits autoplastic material such as fascia, fat periosteum, or tunica vaginalis has been used. The end-results of the operations have been variable. In civil life these operations are seldom performed because good results cannot be assured.

The successful use of the vitallium cap in arthroplasty of the hip joint suggested its use in arthroplasty of the smaller joints of the hand and digits. Two cases so treated are reviewed. In the first an ankylosed metacarpophalangeal joint of the right ring finger was repaired by placing a vitallium cap, 12 mm. in diameter, over the head of the fourth metacarpal bone after removing the bony block. A good result was obtained and the patient was able to flex actively 100 degrees and extend to 160 degrees. The joint was stable.

Following an infection the patient in the second case had an ankylosis of the right middle finger at the proximal interphalangeal joint but the flexor and extensor tendon mechanism was intact. At operation there was a partial bony and fibrous ankylosis of the interphalangeal joint, while the flexor and extensor tendon mechanism was intact. The joint was freed and a vitallium cap, 10 mm. in size, was fitted over the end of the proximal phalanx. The base of the second phalanx was made concave. The wound was closed and the finger immobilized in a banjo traction splint for twelve days. The end-result, three months later, showed active flexion to 90 degrees and extension to 175 degrees and the joint was stable. There are excellent photographs showing the results of these cases in the original article.

The technique of the operation is described. The vitallium is placed over the head of the bone as a thimble, after the bone is shaped and smoothed. No cap is placed on the base of the adjoining phalanx. The cap must be placed in line with the shaft of the bone, obliquity being avoided. The finger is immobilized in a traction splint for twelve days and the patient is encouraged to use the finger as early as possible. The same principles which are used as a guide in the performance of an arthroplasty prevail here as elsewhere in the body.

HARVEY S. ALLEN, M.D.

Milch, H.: The Bifurcation Operation. *Surgery*, 1940, 8: 686.

The bifurcation operation has been recommended for pseudo-arthrosis of the femoral neck, irreducible dislocations of the femoral head, upward dislocation of the femoral shaft following destructive epiphysitis, fractures of the acetabulum, non-united fractures of the femoral neck, and painful coxarthritis in which ankylosis has not occurred.

In essence, the operation constitutes an effort to shift the body weight, so as to restore stability without sacrifice of the mobility of the hip joint. Although the procedure makes no attempt at restoration, either of the normal anatomy or physiology of the injured hip joint, there is no doubt that it does succeed, in many cases, in rehabilitating the functionally incapacitated patient. It is a relatively simple technical procedure, which can be quickly performed with but little shock. It reëstablishes stability in the unstable hip joint. It relieves pain and permits of at least partial physiological rest to an inflamed or otherwise irritated joint.

The objections are development of postoperative knock-knee deformities, loss of configuration and stability in children, interference with mobility of the hip joint, and associated pain.

The first two objections can be overcome by supracondylar linear osteotomy and repetition of the bifurcation operation, respectively. The third objection forms the basis for the author's study.

The response of children to the bifurcation procedure is different from that of adults because the position produced by the operation changes in children while it remains essentially the same in adults. During the early period, stability was restored with-

out exception in children. When excessive abduction, unduly prominent spike formation, or improper double contact with the pelvis occurred, a marked impairment of gait and even painful limitation of motion were commonly seen, but almost invariably these unpleasant sequelæ gradually disappeared as the children grew older. The pain subsided and the gait improved, but all too frequently the previously acquired stability vanished at the same time. When the roentgenographic findings of these patients were examined, it was found that, as the stability disappeared, the femurs manifested a typical sequence of variation. Beginning with the characteristic "Y" shape of the Lorenz bifurcation, the femurs assumed the hockey-stick shape of the Schanz osteotomy and tended ultimately toward the original bone shape.

In the instances in which this did not occur, it was found that, as in adults, pain and limitation of movement were invariably associated with excessive abduction or spike formation. In the unilateral cases, and in the erect position, this interference in motion was marked by tilting of the pelvis. The degree to which such compensation may occur is determined in large measure by the mobility in the opposite hip and the sacrolumbar articulations. When seated, the possibility of pelvic tilt is precluded and the characteristic limitation of movement is readily demonstrable. The patients cannot cross their legs, they have difficulty in putting on shoes or stockings, and they cannot sit on low chairs. However, it is in the bilateral cases that the full extent of the disability becomes apparent. When the abduction of the distal fragment makes an angle with the femoral neck which is greater than the angle of inclination of the outer pelvic wall, the patients cannot bring their legs into a parallel position for normal progression. As a result, the gait is awkward and may best be described as a twisting waddle, which persists despite a negative Trendelenburg sign. The feet are held everted, and rotation is markedly limited. In addition, the patients not infrequently are afflicted with such pain in the groin that they insist upon relief.

In children, the disability may disappear spontaneously as the upper end of the femur loses the appearance of bifurcation. When this does not occur and when the spike persists, these young patients suffer the disturbances which are seen in their elders. In these the same tendency toward loss of the bifurcation may be noted occasionally, but the rate at which this change occurs is so relatively slow that more expeditious therapy must be instituted.

These disabilities can be promptly overcome by resection of the spike which is the hallmark of the bifurcation operation. The fact that this can be accomplished with restoration of mobility and without loss of stability seems to indicate clearly that the spike is not essential to the successful outcome of the osteotomy, and that, on the contrary, it is the cause of the undesirable effects found almost routinely after a typical bifurcation operation.

ROBERT P. MONTGOMERY, M.D.

Cole, W. H.: The Treatment of Claw-Foot. *J. Bone & Joint Surg.*, 1940, 22: 895.

True claw-foot is due to a lesion of the spinal cord, usually spina bifida occulta or poliomyelitis with resulting weakness of certain muscles of the foot. The deformity is largely, if not entirely, one of the forefoot. The forefoot drops because of an ill-defined weakness of some of the muscle groups, and a cavus deformity results. Secondary to this there is the typical contracture of the toes which, except in long-standing, severe cases, disappears when the cavus is obliterated. All grades of cavus are seen, ranging from those of such slight degree that a distinction between a deformed foot and a simple high arch is difficult, to those advanced cases in which there are large callosities or even ulcers under the heads of the metatarsals, marked cocking of the toes with dislocation at the metatarsophalangeal joints, and an excessive degree of cavus with extreme contracture of the plantar structures. Individual bones of the foot may become intrinsically deformed and a true bony cavus exist. Although many cases tend to progress, there are stationary cases of all grades, and the better results, following any but the most radical treatment, are probably in this group.

The object of ideal treatment is to correct the cavus and prevent its recurrence. By systematic treatment some cases can be checked and others corrected so that good functional feet are obtained. It must be remembered that many persons with the milder degrees of cavus go through life with little trouble other than the use of extra caution in the fitting of their shoes. It is when the contractures are such that the feet become painful and callosities develop under the heads of the metatarsals and over the contracted toes, that real crippling occurs.

Several forms of treatment for the various stages are used; they include daily repeated manipulations with flattening of the arch and stretching of the plantar structures; exercises to strengthen the dorsiflexors of the foot without cocking of the toes; the use of an anterior arch bar in the shoe or, better yet, an insole with an anterior bar incorporated in it; the use of a night splint, which also has a bar, to bring pressure back of the metatarsal heads and thus counteract the cavus-forming forces. In more advanced cases closed and open plantar fasciotomies followed by plaster casts may be indicated.

In a majority of the more severe claw feet some operation is needed to prevent recurrence of the deformity. Transplantation of the toe extensors to the cuneiform bones will aid in keeping the sole flat and preventing a progressive cavus. The author advocates a modified Hibbs procedure or transplantation in which the tendon of the extensor hallucis longus muscle and the four tendons of the extensor digitorum longus muscle are placed into the cuneiform bones so that their pull efficiently reinforces the tibialis anterior in dorsiflexing the ankle. After removal of the long extensors from the toes, the smaller toes function sufficiently well, but the great toe will drop; therefore, the interphalangeal

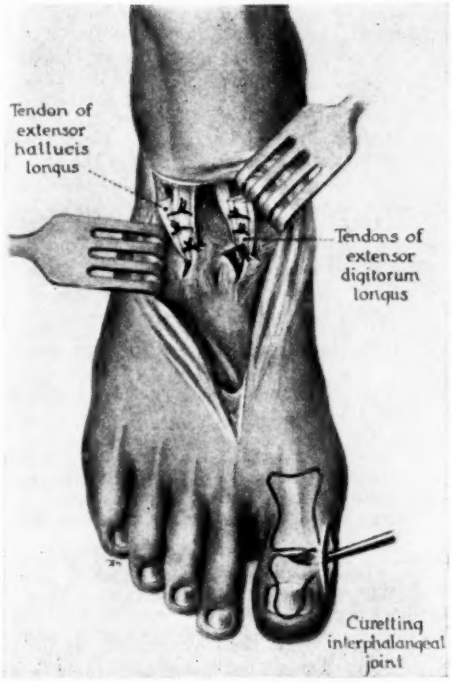


Fig. 1. The tendons have been passed through the tunnel in the cuneiform bones, the extensor digitorum longus bundle from the lateral to the medial side, and the extensor hallucis longus in the opposite direction. The tendons are held in place by interrupted sutures, the distal one on each side passing through the periosteum. Through a small medial incision the interphalangeal joint of the great toe is curetted in order to initiate ankylosis.

joint of the hallux must be immobilized. A tenodesis of the distal stump of the extensor hallucis longus into the first metatarsal is sometimes used in place of the arthrodesis, but the latter is to be preferred in patients more than ten or twelve years of age. The postoperative plaster dressing is removed after six weeks and active physical therapy is started. Weight-bearing is allowed in a shoe with an anterior bar in the insole with an anterior heel or its equivalent.

If bone deformity of any marked degree is present, the cavus cannot be corrected by releasing of the plantar structures and wrenching of the foot. It is then that removal of a wedge of bone is indicated as the only possible way of making the foot symptomatically less disabling and anatomically more normal in appearance. When wedge osteotomy is necessary to overcome the cavus, an anterior tarsal wedge will save function, and correct the deformity. The postoperative short-leg plaster cast is worn about eight weeks; then weight-bearing without support can usually be started.

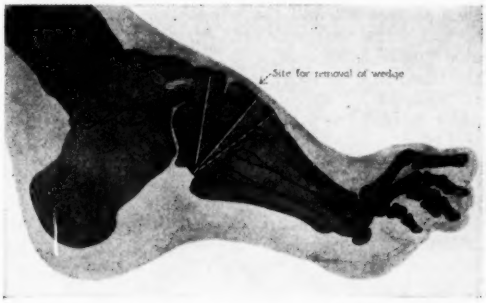


Fig. 2. A diagrammatic representation of the foot to show location of the wedge in anterior-tarsal-wedge osteotomy. Note that the proximal cut is anterior to the midtarsal joint.

It will be found that with correction of the cavus the toes will straighten out. It is only occasionally that any direct attention need be paid to them, although some hammer toes will have to be taken care of in older persons. Callosities disappear when their cause is removed, but at times the use of salicylic-acid preparations will be necessary to hurry the convalescence. The tendon transplantation described may occasionally be indicated after this osteotomy. ROBERT P. MONTGOMERY, M.D.

FRACTURES AND DISLOCATIONS

McKinnon, S. D.: Fractures—Elastic Band Traction. *Canadian M. Ass. J.*, 1940, 43: 324.

The use of elastic bands as a traction force in the treatment of fractures has been limited generally to those involving the phalanges and the metacarpals. However, during the past eight years the author has extended the use of elastic band traction to fractures of other long bones; first, as an emergency measure, and, later, as a procedure that has become almost routine. In as much as simple fractures of the humerus, of the radius and ulna, and of the tibia and fibula seldom require traction, this method has been found most applicable to certain compound fractures of the afore-mentioned bones and to simple and compound fractures of the femur. The method differs only from those in common usage in that the "pull" is obtained by elastic bands under tension. The advantages offered by this method arise from the use of a mobile unit splint-traction device. Elastic bands cut from discarded automobile tubes in widths of one-quarter, one-half, and three-quarter inch are used.

In younger children a general anesthetic is given. Obvious shortening and deformity is corrected by manual traction; the leg is properly cleansed; elastoband strips are applied in the usual manner and fixed to a frame spreader. Elastoplast is used to fix firmly the elastoband to the thigh and leg, that applied to the thigh exerting slightly more than a moderate degree of compression. A well fitted Thomas splint is

then slipped on and the supporting bands are attached in the usual manner. An elastic band of suitable "pull" is selected, and, with one or two ply of the band, the spreader is attached to the distal end of the splint. Tension of the elastic band is set at a point designed to produce a degree of traction which will effect and maintain reduction. This produces a unit splint-traction device which enables transportation of the patient. In older children the anesthetic may be dispensed with or a local anesthetic is used. Occasionally skeletal traction may be necessary. In adults skeletal traction is the method of choice. The supracondylar site is usually chosen for bone transfixion. Elastic traction is made from the stirrup to the end of the Thomas splint. The unit traction-splint may be suspended to an over-head frame.

The author claims that this method of treatment offers the following advantages: low cost, easily improvised equipment of light weight, and a unit splint-traction apparatus facilitating transportation and aiding nursing care, especially in compound fractures.

F. HAROLD DOWNING, M.D.

Winterstein, O.: Unexpected Discoveries with Regard to the Planes of Torsion Fractures (Unerwartete Ergebnisse ueber die Ebenen der Torsionsfrakturen). *Ztschr. f. Unfallmed. u. Berufskrkh.*, 1940, 34: 64.

In the recent fracture material of the University Clinic at Zurich the author studied the comparative incidence of different fracture planes. This has hitherto never been considered in the literature. One hundred and forty-eight torsion fractures are considered. Among these there were 110 spiral fractures of the lower leg, 40 from wintersports, 27 from traffic accidents, and the rest from other common causes. Seventy-seven were rotated outward and 33 were turned inward. The mechanism of the sports injuries is the least difficult to explain; the fractures are, as a rule, turned outward. Outwardly rotated fractures also predominate in traffic accidents. Reconstruction of the events of the accident from the roentgen film is of value in checking the statements of the injured and of the witnesses. The typical site of the outward rotation fracture is in the distal half of the lower leg. The majority of the inwardly rotated fractures, however (by a ratio of 2:1), are in the proximal half of the lower leg. Theoretically, the fibula should be fractured further proximally in outwardly rotated fractures and further distally in inwardly rotated fractures. There are many exceptions to this.

Twenty-three spiral fractures of the upper leg were divided evenly between sport and traffic accidents. With regard to the mechanism of injury, considerations analogous to those in the lower leg hold true for the upper leg. The torsion is carried over into the femur by the fact that at the second of the impact the knee is held completely stiff by maximum muscle contraction, and the twisting force operates through the bent knee on the femoral condyles. In 17 cases the torsion was inward. The localization of these fractures was predominantly in the midshaft; in second place was the proximal third; and in last place the distal third. The explanation is in the strength of the cross-sections of the bone.

The striking frequency of inward rotation fractures is explained by the greater resistance of the stout fibular collateral ligament to force applied when the foot is inwardly rotated and the knee extended. In case of a fall with the knee bent this is held fast as a support. The least undesirable result of this is that the lower leg and foot are forced backward and outward. Thus the upper leg comes into internal rotation. Falling forward or twisting the body toward the breaking leg contributes to the inward rotation fracture.

One-half of 15 torsion fractures of the upperarm were outwardly rotated, and one-half were inwardly rotated. The great freedom of the shoulder joint makes that understandable. Midshaft, distal, and upper third is the order showing the frequency of the fracture sites.

The knowledge of the course of the torsion plane is important in treatment, particularly with regard to the possibility of secondary displacement.

(HEINEMANN-GRUEDER). RICHARD WARREN, M.D.

Schede, F.: Results of our Treatment of Congenital Hip Luxation (Die Ergebnisse unserer Behandlung der angeborenen Hueftverrenkung). *Ztschr. f. Orthop.*, 1940, 71: 3.

This report covers the investigations of the last fifteen years. The conception of cure according to Lange and Kreuz is given in abstract. A hip joint is cured anatomically when it appears absolutely normal in the roentgenogram, and shows the superior part of the articular cavity to be fully developed, with completely congruent spheric terminal surfaces of the head and of the articular cavity, and entirely normal articulation with ability to carry the body weight. Joints showing this result belong to Group I. "Functionally" cured joints, although functioning well, show distinct deviations from the norm in the roentgenogram. These belong to Group II. Group III represents imperfectly formed articular joints and femoral heads as well as malformations of the femoral necks, inasmuch as function is not materially impeded by them. Group IV represents the serious malformations with distinct functional disturbances.

The condition of the joint four to five years after reposition is called the primary result of the cure, and this remains unchanged, as a rule, until the beginning of puberty. We speak of the end result only after development is complete, since some cases show a change for the worse during puberty. It is asserted that patients who have recovered perfectly from an anatomical point of view during the first four years are much less subject to a change for the worse, so that anatomical cure is synonymous with permanent cure.

Early treatment and correct after-treatment are essential for an anatomical cure. A subsequent

change for the worse in a primary anatomically cured joint has not been observed. In a critical review of the reports on treatment which are at hand, we are warned of exaggerated pessimism. Progress in therapy is impossible without a certain amount of unswerving optimism.

Among 74 cases in which replacement was done from 1924 to 1929, more than half of the unilateral luxations belonged to Group I and of the bilateral luxations, more than one-quarter. Group IV was represented by 2.8, i.e., 7.7 per cent. All patients belonging to Group I have passed through puberty without damaging effect. One fact appears certain, namely, that the primary anatomically cured joint is more permanently cured than the functionally cured one. End-results will therefore become more satisfactory if the number of primary anatomical cures can be increased. It is generally known that *early treatment* is of the greatest importance. By this is meant treatment in the first year of life. Early diagnosis is taken for granted. The helpful suggestions of Hilgenreiner are dependable and indispensable. When the tendency to luxation appears evident, some kind of abduction treatment must be introduced immediately. In case of diagnosed luxation simple abduction treatment is insufficient, and correct reposition is necessary, preferably under anesthesia. Fear of trauma following reposition is unfounded, because it plays no part in a subsequent head deformity. A plaster cast is always the best means of retention. It must fit very snugly around the trochanter, but may be loose otherwise. The duration of the plaster-cast treatment in the first year of life has been reduced to two months. For the sake of keeping the child clean while in the cast, the bivalved plaster cast is essential because it is the only means to assure dependable support, and also because the joint which appears to be normal usually is also affected.

One of the main achievements of the last decades which had for its purpose the primary anatomical cure is the functional after-treatment. Preliminary treatment for recasting of the joint deformed by luxation consists of reposition and retention, to be followed by after-treatment. The purpose is: (1) ossification of the upper portion of the articular cavity and deepening of the cavity, (2) transformation of the femoral head from a flattened to hemispherical shape; and (3) lowering and torsion of the femoral neck. Development depends on the congenital malformation and also upon the function. The effect of the first cannot be evaluated, but function can be accurately apportioned.

According to Murk Jansen's law of the vulnerability of rapidly growing cells, the effect of stimulus through pressure and articulation varies with the age of the patient. With regard to their intensity, pressure and articulation must be accurately graded in order to be of optimal effect. Both insufficient and exaggerated stimulation may become dangerous. A certain percentage of the occurring disturbances in the development of the reposed hip joint can be avoided, particularly those which are caused by the seriousness of secondary changes already present (reposition done at an advanced age), and those which are caused by a faulty mechanical stimulus.

Regarding the possibility of predicting the developmental process, the author has been entirely misled by the study of end-results. Hilgenreiner's stigmata are not dependable. The question whether developmental disturbances are endogenous or functional cannot be answered as yet. To do this we need material taken from the first year of life which is still free from secondary changes. In addition to the individuals with true congenital luxation there is a larger group which merely show a congenital susceptibility to luxation. It is possible, therefore, that the susceptible joint may become dislocated, may remain flat without clinical manifestations (functionally normal), or show subsequent regressive transformations and very late manifestations (malum coxæ). Premature osteosclerosis of the roof of the articular cavity appears, if at all, during the first two years after reposition. It may be endogenous or exogenous and offers an unfavorable prognosis. It should be treated early by means of plastic operation. The so-called osteochondritis of the upper femoral head is not an illness nor a result of trauma following reposition, but merely a roentgenological sign of the functional transformation. In cases in which transformation remains stationary, i.e., when the formation of a new head fails to be accomplished, or if the new head remains flat, broad, and irregular, the procedure must be diagnosed as pathological. During puberty which offers conditions similar to those of the first years of life, the reposed hip joint is again seriously endangered. Treatment must be the same as in the case of infants: abduction, outdoor treatment, anti-rachitic measures. This should be continued over a period of six months. The most intensive and rapid transformations have been observed during this revolutionary developmental crisis. Surgical reposition is rarely used because the mechanical device of Weber's luxation table which is used in difficult cases has always made reposition possible except in 5 cases. Beginning with approximately the seventh year, reposition should not be attempted any more. Exceptions confirm the rule. At this point plastic surgery of the articular cavity is indicated, and it can be resorted to without hesitation even after the thirtieth year.

The author has included a number of excellent and highly interesting roentgenograms and a complete bibliography.

(HACKENBROCH). HILDA H. WULLEN.

Felsenreich, F.: Histological Studies of Cases of Operated Fractures of the Femoral Neck. The Phenomena Occurring in Bone and Cartilage following Bone Necrosis (Histologische Untersuchungen an operierten Schenkelhalsbruechen. Die Vorgaenge am Knochen und Knorpel nach Knochennekrose). *Arch. f. klin. Chir.*, 1940, 198: 532.

The author enhances his eighth report concerning histological studies of cases of the femoral neck

which have been operated upon with numerous impressive and clearly described photomicrographs and roentgenograms. After a comprehensive review of the literature he discusses the reorganizing phenomena following bone necrosis in the femoral head on the basis of a microscopic study of 14 specimens, obtained more than two months following operation. He recognizes a "zone-like revitalization," "concentrically superimposed layers upon the necrotic bone," and a reorganization of the dead bone which appears to be typical in conjunction with simultaneously existing osteomalacia. In the first form, similarly to Freund, he found 4 zones: (1) a wall of fibrin, as indication of an aseptic inflammatory reaction of the infiltrating tissue to the necrotic fatty marrow; (2) a zone of fibrous marrow with lacunary bone resorption; (3) a zone of concentrically disposed layers of tissue; and (4) a zone of final bony metamorphosis into sclerotic or porous bone depending on the functional demand. The microscopic changes within these zones are described and the course of the revitalizing processes are reconstructed on the basis of the studies made.

In this zone-like reconstruction, there occurs a poorly developed layer within the fibrous marrow with which the hypersclerotic zone of reconstruction is continuous. In the second form of the concentrically superimposed tissue, there is a reconstruction process in which, because of the peculiar general or local circumstances, a large amount of the new bone tissue is formed, just as in the zone-like revitalization of the bone, without the occurrence of any extensive resorptive phenomena. In other words, the resorptive phase is lacking. It is in this remarkable manner that hypersclerotic bone is exclusively formed, which everywhere retains necrotic bone tissue within its intertrabecular spaces. In the third form, the necrotic bone, depending upon the stage of the osteomalacia just as in concentric superimposition, is finally covered either by osseous or calcium-containing bony layers which are easily recognizable because of the abundant cementing lines. Because of the marked hyperemia of the marrow, the process later progresses to cavitation of the more centrally located necrotic trabeculæ by fibrous marrow and blood vessels, and these spaces then become lined by osseous tissue. Thus, frequently pipe-like arches similar to the "spongiosa tubulosa" are formed, which in this instance may be considered as indicative of bone reconstruction under the influence of functional irritation following necrosis. In the reconstruction of the cortex, phenomena occur which are similar to those in the reconstruction of the spongiosa. Here also are found "zone-like revitalization" as well as the concentric deposition of tissue and the typical reconstructive processes of osteomalacia.

Whereas in the first two forms, for the most part, a weight-bearing structure develops, this is not the case in the last form because the continuity of the cortex is disturbed as a result of the reconstructive processes. Deep layers of cartilage, and zones of calcification and general lamellæ are destroyed because the cortex, in the course of reconstruction, extends deeper toward the marrow. The connection between the cartilage and the new cortex does not occur over a continuous bony surface, but rather by means of individual columnar projections, as a result of which the firmness of the cortex is diminished. Secondarily occurring necrotic foci following the introduction of a second nail undergo reconstruction like the primary foci. The age of the foci can be easily recognized by the conditions found in the spongiosa.

The injury of the cartilage takes place in the same way that vascular bony injury occurs. The changes which take place in the cartilage during the reorganization of the bone are, therefore, reparative processes, just as Axhausen assumed them to be, in contradistinction to the views of Pommer who called them an "osseous form of arthritis deformans." The fibrous condition of the cartilage is variably influenced by the nutritive disturbances, which depend upon the position of the fibrous portion. The conclusion that we almost always find a proportionally severe damage of the cartilage after a prolonged continuous ischemic damage of the bones appears of importance. It is demonstrable (by staining) that the cartilage repair processes become recognizable much later than do those of the bone. This is probably to be explained by the fact that in total subchondral necrosis and long-lasting circulatory disturbances, enduring for weeks and months, the cartilage is no longer able to recuperate. However, a transitory ischemia, on the other hand, hardly affects the cartilage. Even a very delicate pannus may be able to sustain the vitality of the entire cartilage or at least of its major part. This fact confirms the assumption that the cartilage is extensively dependent upon the subchondral vascular network as far as its nutrition is concerned.

The genesis of delayed fractures is discussed on the basis of an extremely instructive case. Numerous proofs exist that after a certain period of time the hip bone will undergo fracture of its superficial surface in the region of the completely necrotic bone. This process, according to Axhausen, may be attributed to the physical changes of the collagen fibrils. Such fractures take their origin frequently from the weak points of the surface of the femoral head. The fractures occur in series, and occasionally revitalization may occur between these different series of fractures. The reparative structures formed during such periods of convalescence can later again undergo necrotic changes after new fractures set in. Should this process take place on the superficial surface of the femoral head, it will result in a "caput deformatum." Should this process, on the other hand, take place near the fracture line surfaces, it will result in resorption of the head and neck. The lines of these fractures frequently extend into the revitalized zones and finally find their termination in the region of the fibrous marrow zone, where the spongiosa has been made susceptible to spontaneous

fractures because of resorption. Occasionally the fracture line at this point will undergo a deviation of its course and continue on in a more transverse direction toward the cortex. This deviation of the course of the secondary fracture lines is brought about by the hypersclerotic zone of bone reconstruction, which hinders the further progress of the spontaneous fracture. In the fibrous marrow zone itself, such secondary fractures heal by hypertrophic callus formation (hard connective tissue, cartilage). Those places where an impaction of the broken trabeculæ has occurred usually heal by means of bony repair. The hypertrophic, callous soft-tissue formations choke off the marrow spaces and thus hinder the reconstructive process in the remainder of the femoral head. Thus, one can observe bony healing in the secondary fractures next to reparative structures similar to pseudarthroses.

Of the various processes described in the histological picture, the following are accompanied by roentgenograms: (1) secondary fractures of the cortex within bone of normal structure with simultaneous resorption of the head and neck; (2) zone-forming reconstructive processes; (3) diffuse sclerosis of sagittal sections of the craniad portion of the head of the femur which had formerly been necrotic but had undergone reconstructive processes accompanied by mild changes in the form of the femoral head; (4) sequestra riding upon the nail which was still present; and (5) healing sequestration following the removal of the nail.

From the studies presented above, the following practical important conclusions may be drawn. Widespread necroses are very common. The reconstructive process requires many months and frequently years for its completion. Its course is dependent upon the vascularization of the surrounding tissues, upon the length of time which has transpired since the injury, and upon the amount of weight-bearing and rest to which the affected region is subjected; spontaneous secondary fractures are of relatively frequent occurrence. When the conditions are favorable the latter may undergo bony healing; otherwise they undergo healing with pseudarthrosis formation, and even in the most favorable cases will lead to sequestration on the surface of the femoral head and to resorption of the head and neck in the region of the fractured surfaces. The prognosis of the operated cases of fracture of the femoral neck is determined by the various processes described. One is not justified in rendering a conclusive opinion in an operative case after one or one and one-half years, but after three years such an opinion may be rendered with greater assurance. Of the greatest importance, it seems, is the fact that the nail, because of its strength and mass, tends to hinder the reconstructive processes within the portion of the femoral head which lies craniolaterally to it, a portion of the head which *per se* shows a tendency to become the prey of necrosis and remain necrotic for a long time following fracture. For this reason the nail should be removed whenever possible, after indubitable bony healing of the fracture, in order to make it possible for the living tissues of the caudal portion of the head to grow more rapidly into the necrotic portion. As a result of these studies, postmortem proof has been brought forward to show that the author's proposal to place the nail in a more caudal section of the head, in order to promote the reconstructive processes of the necrotic cranial portions of the femoral head, is important. Eighteen photomicrographs accompany the original article.

(Tilk). Harry A. Salzmann, M.D.

ORTHOPEDICS IN GENERAL

Horwitz, T.: Ischemic Contracture of the Lower Extremity. *Arch. Surg.*, 1940, 41: 945.

The author presents 2 new cases of ischemic contracture involving the lower extremities and reviews the 18 previously reported cases in the literature. The 2 new cases are of eleven and fourteen years' duration and present the following features: (1) healed fractures of the femur; (2) massive induration of the muscles of the leg and foot associated with atrophy and loss of motor power below the knee; (3) vascular dysfunction in the involved lower extremity; (4) contractural deformities of the foot and toes; (5) roentgen evidence of extra-osseous calcification of the leg; and (6) histological evidence (in 1 case) of massive degeneration of muscle tissue with fibrous-tissue replacement and extensive calcification. In these cases there was a pathological state in the lower extremity identical with Volkmann's ischemic contracture of the upper extremity.

Its occurrence must be anticipated after fracture or extensive injury to the soft tissues without fracture, especially in the region of the knee and leg. The stage of contracture and deformity may be avoided by fasciotomy during the acute (prodromal) stage. Deformities of the lower extremity consequent on the contractures may be corrected by adequate non-operative and operative measures. The wisdom of fasciotomy during the acute stage, in the lower extremity as in the upper extremity, appears to be substantiated by the recovery and the avoidance of contractural deformities in the case reported by Jones and Cotton, after exposure of the popliteal space and evacuation of its extravascular bloody contents. If the dreaded contracture is to be avoided, pressure must be relieved immediately, as soon as the earliest evidence of impending vascular interference becomes recognizable.

Extra-osseous calcification representing the dystrophic form of pathological calcification is characterized by the deposit of lime salts in tissue of low viability or in dead tissue. Available evidence indicates that this process is associated with vascular deficiency and is dependent on local factors such as the hydrogen-ion concentration and carbon-dioxide tension.

A description of the histological features in the acute stage and in the stage of contracture is presented along with photographs, photomicrographs,

roentgenographs, and detailed case reports including treatment of the 2 new cases. The clinical features of the acute stage are pain, cyanosis, edema, paresthesia, hypesthesia, loss of motor power, and trophic disturbances. In the residual stage the muscles become rigid and contracted, an equinus deformity develops, cavus and varus deformities of the foot occur, and there are multiple hammer-toe contractures. ROBERT P. MONTGOMERY, M.D.

Guth, K.: Experiences with the Pirogow Amputation of the Foot (Erfahrungen mit der Fussamputation nach Pirogow). *Muenchen. med. Wchnschr.*, 1940, 1: 502.

The Pirogow operation is discredited by many general and orthopedic surgeons. This is not warranted as evidenced by the author's own personal experience with this method. During the first World War the author was operated upon according to the Chopart method. The stump was useless because of the sharp-pointed position of the foot and persistent suppuration. Therefore, a Pirogow amputation was done later and the heel-bone nailed from below to the sole of the foot. This amputation healed by primary union. Guth has used this stump for twenty years and, except for a hypersensitivity to cold, finds it entirely free from any annoyance. He not only attends to all the duties of a country doctor, but also indulges in sports. He won the second prize at an international skiing competition in Arosa for rapid clearing of the starting point. At present he also performs the duties of sanitary officer of the army. He wears a hollow wooden, steel-reinforced splint containing a strong Marx-foot; this brace extends upward to the knee and tapers toward the foot. He has worn this last-named prosthetic apparatus for the past ten years. His gait is practically normal, despite the fact that this prosthetic aid makes his leg 4 cm. longer; also, the prosthesis causes no feeling of discomfort upon hip-joint movement.

The advantages of the Pirogow method are:

1. Very good skin condition on the plantar surface of the foot.
2. Complete carrying power without slipping and without loss of support of the head of the tibia.
3. The possibility of walking home without the prosthesis.

The disadvantages are:

1. The clumsy appearance of the stump with its thick ankle-joint area.
2. The lengthening of the leg by 5 or 6 cm.
3. The impossibility of wearing normal shoes or boots.
4. The difficulty of making the prosthetic apparatus.

The author considers the requirements of a good stump to be aseptic healing; and correct axial alignment of the heel cap.

(FRANZ). MATHIAS J. SEIFERT, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Pearse, H. E.: Experimental Studies on the Gradual Occlusion of Large Arteries. *Ann. Surg.*, 1940, 112: 923.

There is no completely satisfactory method for the gradual occlusion of the great vessels despite the repeated attempts to perfect one, for, though many ingenious instruments have been devised, all of them have some drawback. Such a method is desirable in order to treat aneurysm and other lesions of large arteries.

During the last century many attempts were made to produce gradual progressive occlusion of the aorta and other large arteries by means of bands, clamps, or ligatures which compressed the vessel. All experience has shown that the force of the pulse pounding against the compressing device will weaken and rupture the arterial wall. All methods that depend upon external compression are dangerous.

Theoretically, there are at least three other methods by which large arteries can be gradually obstructed: by internal occlusion with thrombosis; by intrinsic contracture of the vessel wall after its injury; and by extrinsic contracture of the scar tissues around the artery. These have been tested experimentally.

About twelve years ago, a method was reported for closing the thoracic aorta of dogs by thrombosis which was produced by means of a spring screwed into its lumen. Continued observation of these animals, one of them for seven years, revealed the persistence of a major degree of obstruction. The particular virtue of the spring is the tenacity with which it holds the thrombus by the multiple coils within the lumen. This not only prevents embolism but gives a more permanent occlusion. The disadvantage of the spring is the difficulty of inserting it into the vessel in a deep wound, but, thus far, no better method of intravascular closure has been found.

Intrinsic contracture was attempted by injury with iodine, silver nitrate, sodium morrhuate, or acriflavine painted on the arterial wall or injected into it. This caused no narrowing of the vessel. Diathermy coagulation resulted in temporary constriction, but eventually there was restoration of the lumen to a normal caliber. Apparently, too little damage is produced by these means to cause occlusion or even permanent constriction of the aorta.

Extrinsic contracture of the perivascular structures was first attempted by the use of large amounts of fascia, but this relaxed rather than contracted. Acriflavine and silica have been tried without effect as yet.

A striking result followed the use of cellophane wrapped loosely about large arteries. An intense perivascular irritation was produced by the cellophane, first with constriction of the vessel, and then with invasion and destruction of the intima, which resulted in complete closure. This occurred even in the aorta. It was the first time that complete occlusion was produced by extravascular contracture.

Closure of the aorta both by intravascular thrombosis and by extravascular irritation has been demonstrated. It remains to perfect the methods by which this is done, for they can, in all probability, be improved upon. PAUL MERRELL, M.D.

Holman, E.: Clinical and Experimental Observations on Arteriovenous Fistulas. *Ann. Surg.*, 1940, 112: 840.

On the basis of clinical experiences Holman emphasizes the following points concerning arteriovenous fistulas:

1. Complete cardiac decompensation with peripheral edema, ascites, hydrothorax, and extreme dilatation of the heart may be completely corrected with return of the heart to normal size by the elimination of a peripheral fistula. This dilatation involves not only the heart but the great vessels at the base of the heart as well, as is demonstrable by roentgenograms taken before and after elimination of the fistula.

2. Early evidence of the malign influence of a fistula upon the circulation—even before dilatation of the heart is detectable—is the behavior of the blood pressure and pulse following closure of the fistula by digital pressure: an increase in blood pressure and a fall in pulse rate, even though both are small, indicate that the fistula is large, that it is not likely to close spontaneously, and that it is almost certain to produce increasing deleterious effects upon the circulation.

3. This increase in blood pressure and fall in pulse rate are the first evidence that the circulatory bed through which the short-circuited blood flows is beginning to dilate, even though such dilatation may not yet be detectable by the usual means.

4. The extent of the increase in blood pressure and the fall in pulse rate depends upon the duration of the fistula and is commensurate with the extent of the dilatation of the heart and vessels proximal to the fistula, being least in the fistulas of short duration with no or slight dilatation, and greatest in the fistulas of long duration with great cardiac dilatation.

5. A temporary but great increase in blood pressure and fall in pulse rate may occur immediately following the elimination of a fistula by operation, provided the operation is performed as a physiological experiment without loss of blood. Despite prolonged operations, taking from four to six hours, the blood pressure at the end of the operation was higher and the pulse slower than at the beginning, because of an autotransfusion from circulating blood

which had increased in volume during the presence of the fistula.

6. The temporarily great increase in blood pressure and fall in pulse rate on closure of a fistula are dependent upon an increase in the total blood volume, which is an inevitable accompaniment of a fistula of large size and long duration. One case showed a drop in blood volume from 7,200 to 6,200 c.cm. after the removal of the fistula, and in another case the blood volume dropped from 5,000 c.cm. to 4,200 c.cm. after elimination of the fistula. Both cases showed marked cardiac dilatation and marked effects upon the blood pressure and pulse, upon closure of the fistula.

7. The increased blood volume is reduced immediately following operative removal of a fistula by a reduction in the plasma as shown by the increased urinary output and a concentration of the red cells and hemoglobin in the blood.

8. This increased blood volume may result in a transient overdistention of an already dilated heart following closure of a fistula by operation, because of a redistribution of the circulating blood, the volume of blood formerly diverted through the fistula into the capacious venous system now filling the central arterial bed.

9. Eight cases of peripheral fistula were eliminated by excision or ligature of the segments of the main vessel to a limb without any evident effect upon the viability of the tissues beyond the ligature. In 1 case the common femoral, deep femoral, and superficial femoral arteries were all ligated without impairment of the nutrition or function of the leg. This is explicable on the basis of the stimulus to the collateral circulation provided by the area of diminished peripheral resistance at the site of the fistula, which attracts blood to it through all available channels.

10. When quadruple ligation of the vessels proximal and distal to the fistula is indicated, it would be desirable to ligate and divide the artery proximal to the fistula rather than to ligate it in continuity. In 1 case, the fistula was reactivated by the ligature cutting through the arterial wall and thereby reëstablishing the lumen of the artery.

Experimentally, in the first twenty-four to forty-eight hours after the establishment of a large arteriovenous fistula, the heart diminishes in size; this is followed, if the animal survives, by a prompt return to normal, and, subsequently, there is a gradual dilatation which may be apparent within four or five days.

Death due to an excessive diversion of blood through the fistula may occur, accompanied by a marked diminution in the size of the heart. The dilatation that accompanies an arteriovenous fistula is not restricted to the heart but affects the vessels involved in the fistulous circuit. The same cause is responsible for both dilatations, an increase in the volume or bulk of blood flowing through that part of the circulatory system through which the blood short-circuited by the fistula must flow, namely, all the chambers of the heart, the proximal artery, the fistula, and the proximal vein. In the growing animal, the dilatation and enlargement may be very great without evidence of decompensation and may be accompanied by pronounced hypertrophy. It is suggested that when dilatation outstrips hypertrophy, decompensation occurs; when dilatation is paralleled by a commensurate hypertrophy, great enlargement and dilatation of the heart may occur without decompensation. In a crucial experiment, involving 3 litter mates of equal weight and stature, 1 acting as control, 1 having an aorta-vena-cava fistula 12 mm. in circumference, and 1 having an aorta-vena-cava fistula 18 mm. in circumference, there occurred an increase in blood volume commensurate with the size of the fistula. In the same animals an increase in the capacity of the circulatory system occurred, also commensurate with the size of the fistula. The increase in capacity and the increase in blood volume closely paralleled each other. In an animal with bilateral femoral fistulas the increase in blood pressure and reduction in pulse rate were greatest when both fistulas were closed simultaneously, and considerably less when either fistula was closed separately. The physiological effect of a fistula, therefore, clearly depends upon the volume of blood diverted through the fistula and, therefore, upon its size. The transient high systolic and diastolic pressures that persist for several days following operative closure of a fistula are due to the increase in blood volume that has occurred during the existence of the fistula. The permanent elevation of diastolic pressure is secondary to the elimination of an area of decreased peripheral resistance. In animals having bilateral femoral fistulas, venacaval pressures were highest with both fistulas open, least with both fistulas closed and intermediate pressures were obtained on closure of one or the other fistula separately. Venous pressures proximal to a fistula are determined by the volume of blood diverted through the fistula and, therefore, by the size of the fistula. MANUEL E. LICHTENSTEIN, M.D.

Groth, K. E.: Tumor Embolism of the Common Femoral Artery Treated by Embolectomy and Heparin. *Surgery*, 1940, 8: 617.

An uncommon case of embolectomy of the common femoral artery is reported by the author. According to all experience, occluding embolisms of the arteries of the circulatory system resemble each other in two respects: (1) the source, which apart from rare cases of so-called paradoxical embolism is generally the left half of the heart and occasionally the central parts of the aorta; and (2) the material in the embolus itself, which usually consists of centrally formed thrombus matter. The case herewith discussed differed in both respects: (1) the source of the embolus was undoubtedly the lungs; and (2) the material in the embolus consisted mainly of tissue of a malignant tumor, viz., sarcoma.

Together with the embolus, there was extracted a postembolic thrombus, approximately 8 cm. long.

Repeated arteriotomies and removals of re-formed clots and intra-arterial injections of eupaverin produced only a temporary circulation, and the circulation was definitely restored only when the artery had been cleaned out for the fifth time, followed by an intra-arterial injection of heparin. The heparinization entailed no trouble.

The source of the embolism and the treatment are discussed. Embolism in the lower limbs should be subjected to operative treatment, especially if tumor embolism is suspected. The limited clinical experience so far gained with heparinization in cases of embolectomy would seem to promise a better prognosis, there now being better prospects of mastering secondary thrombosis. Cautious heparinization should be performed after each embolectomy. The right moment for heparinization is when the artery has been cleaned and the incision sutured. Preoperative heparinization should be avoided as it entails unnecessary risks of complications.

General rules for the dosing, based on sufficient clinical experiences, are as yet lacking. It goes without saying that the smallest effective dose must be the aim. In this case, 100 mgm. injected intra-arterially proved to be quite effective and entailed no complications. This dose corresponds to a little more than 1 mgm. per kgm. of body weight. In the event of bleeding locally, a 0.5 per cent thionin solution, which is non-toxic, is recommended. If swabs of cotton wool dampened in this solution and pressed against the bleeding spot do not produce the desired effect, it can be covered with a piece of muscle soaked in the solution, which heals and produces a reliable hemostasis. HERBERT F. THURSTON, M.D.

Smith, S.: A Soluble Rod as an Aid to Vascular Anastomosis; An Experimental Study. *Arch. Surg.*, 1940, 41: 1004.

The feasibility of suturing severed blood vessels has been established by the "auto-hetero" and devitalized vascular transplant work of Carrel and Guthrie. However, the Carrel-Guthrie technique of end-to-end anastomosis presents technical difficulties which have discouraged its use except by the surgeon with special training.

It is evident that intravascular thrombosis is the primary factor to be guarded against in vascular anastomosis. Local thrombosis is accelerated by liberation of thromboplastic substance, which, to a large degree, parallels the amount of real trauma to the intima of the vessels. The precautions to be observed, therefore, are:

1. Minimal trauma to the vessels, especially to the intima, by delicate handling.

2. Sutures treated with liquid petrolatum or olive oil (platelets are less apt to stick to oil-soaked sutures) should be used and a minimum of the suture material should be exposed to the blood stream.

3. Minimal constriction of the lumen at the site of suture so that, by Venturi action, an increased number of platelets are not brought in contact with the exposed parts of the sutures.

The author has devised a technique based on the use of a soluble rod introduced into the lumen of the severed vessel so that the mechanical form facilitates the proper approximation and suturing of the ends of the vessel. He describes the method of producing a soluble rod, which is as follows:

With the observance of strict asepsis dextrose is heated slowly to 160° C. The slightly caramelized liquid is poured (or sucked) into sterile rubber tubes ranging in inside diameter from 2 to 3 mm. The filled tubes are then cut into segments 3 cm. long. These segments are dropped into ether for a few minutes. The rubber softens and swells, which permits the dextrose rod to be slipped out of the rubber mold with ease. The rods are then coated with some substance that will serve to protect the intima from the dehydrating action of the dextrose. Such a substance may be gelatin (3 per cent solution) or an oil which is liquid at body temperature. If gelatin is used, it must be made up in a solvent which is relatively non-solvent for dextrose. Dodeconyl alcohol serves this purpose.

The rods may be fastened to needles which serve as handles, and may be dipped repeatedly into warm, sterile gelatin solution until a fairly uniform coating of gelatin is obtained. They are then fastened by means of the handle of the needle to a sterile cork plate in a vacuum desiccator. A partial vacuum is created. The gelatin coat dries in two or three days.

An alternate and simpler method, more recently used, is to coat the rods with an oil which, in the amounts used (0.02 c.cm.), probably presents no practical dangers from oil embolism. For this purpose theobroma oil U.S.P. (cocoa butter) is blended with some other fat, with wax or with paraffin (with a higher melting point). Theobroma oil U.S.P. (75 per cent) and paraffin (25 per cent by volume) produces a blend which liquefies at body temperature. The rods are dipped into sterile solution once, fastened immediately to a sterile cork plate in a desiccator, and stored until used.

After describing the method of producing a soluble rod, the author gives his technique of suturing over this soluble rod. The soluble rod goes into solution very shortly after the circulation is re-established through the repaired artery. PAUL MERRELL, M.D.

BLOOD; TRANSFUSION

Scudder, J.: Studies in Blood Preservation. *Ann. Surg.*, 1940, 112: 502.

The author notes that for over a century interest has centered in the preparation of an artificial fluid medium which could be used for perfusion experiments. Today, the increasing interest in plasma transfusions signifies a nearer approach to this ideal. The advantages of plasma are many:

It is a more stable system than blood; because of its buffer capacity, it is superior to acacia, glucose, and salt infusions. Its ionic content is of physiological proportions; it contains certain organic substances necessary for maintaining protoplasmic irri-

tability; and, in addition, it possesses proteins which are concerned with innumerable functions of the body economy.

The progressive deterioration of preserved whole blood has become apparent. On the other hand, the stability of preserved plasma is now recognized.

In a comparison of plasma with blood substitutes, it is noted that the plasma is non-antigenic. Repeated plasma transfusions have been given without anaphylactic reactions. Thus, plasma may be safer than blood. Plasma is less toxic. There have been many untoward reactions with serum. The reactions become graver with the use of heterologous sera. What gives rise to this difference between serum and plasma is not known.

Another advantage of plasma is that it can always be kept on hand for emergency use. While whole blood deteriorates rapidly, plasma has been preserved in storage for months. The desiccation of plasma by the lyophile process may extend the period of preservation for years.

The purpose of the investigation reported herewith is to reëxamine these plasma proteins, and to ascertain which factors govern their stability and enhance their preservation. The electrophoretic method of analysis for proteins was used in this study. Refrigerated plasma samples of varying ages were obtained from three different blood banks in New York City. In addition, unrefrigerated samples were examined, as well as placental plasma obtained from autopsy rooms. A specimen of dried serum prepared by the lyophile process was studied also.

In preserved plasma the greatest change appears as a decrease of albumin, as well as an alteration in the components which constitute the albumin-globulin ratio. Fibrinogen appears unaltered. A definite increase appears in the gamma globulin. In comparing the refrigerated samples with those that had been kept at room temperature and had been shipped about the country, the greatest difference is seen in the beta-globulin fraction. Both the autopsy serum from the child and the plasma from the adult were abnormal. The placental plasma appeared within normal limits. The lyophilized serum presented an anomaly—beta disturbance was missing.

While no conclusions can be drawn from this small series, certain indications may be mentioned:

First, as to the source of the preserved blood, post-mortem blood appears abnormal; this may not apply to those who have met sudden death. Placental blood would appear to be a normal source for conserved blood. Lyophilized serum appears abnormal. Refrigeration seems to enhance the preservation of plasma as did the shape of the flask.

HERBERT F. THURSTON, M.D.

Dubash, J., Clegg, O., and Vaughan, J.: Changes Occurring in Blood Stored in Different Preservatives. *Brit. M. J.*, 1940, 2: 482.

The authors present a report of an investigation made to study the changes that occur in certain elements of the blood stored in different preservatives.

The following characteristics were initially chosen for analysis: (1) total red-cell count and red-cell fragility in hypertonic saline solution; (2) total white-cell count and differential count; (3) platelet count; (4) sedimentation rate; and (5) coagulation time.

After a few observations it was found that the most striking effect of changing the preservative was upon the red cells. Therefore, in subsequent examinations, the red cells only were studied.

The solutions used as preservatives were: (1) saline citrate solution; (2) the same saline citrate with the addition of 0.3 per cent glucose; (3) and (4) both of the above solutions fully oxygenated; (5) the saline citrate solution with 3 per cent glucose; (6) the saline citrate solution with 6 per cent glucose; and (7) caramelized 0.3 per cent glucose saline citrate.

The sedimentation rate is retarded in stored blood. This appeared to be slightly less definite in solutions containing glucose. The polymorphonuclears were completely absent after ten days in all samples, disappearing in the majority of cases by the seventh day. The platelet count fell on storage, but after the end of the second week a fairly constant count of 40,000 per c.mm. was still present, both in the saline citrate and in the glucose-saline citrate. This result is not in agreement with those of previous observers who state that no platelets are found at the end of fifteen days. There was a steady increase in mean corpuscular fragility in all solutions hitherto investigated, but it was most marked in those which did not contain glucose.

In solutions that do not contain glucose the red-cell count falls below 3,000,000 per c.mm. at approximately the end of the second week; in solutions containing glucose up to 3 per cent the count is maintained at the 3,000,000 level in some instances for longer than a month.

In concluding, the authors state that glucose in a final concentration of 0.1 per cent and 1 per cent favors the preservation of red cells in stored blood through its effect on red-cell fragility. Red-cell counts on stored blood must be made by using plasma as the diluent. HERBERT F. THURSTON, M.D.

Levinson, S. O., Rubovits, F. E., and Necheles, H.: Human Serum Transfusions. *J. Am. M. Ass.*, 1940, 115: 1163.

One of the fundamental requirements in combating shock is restoration and maintenance of adequate volume of the circulating blood. Whether shock is primary or secondary, whether due to hemorrhage, trauma, or toxic substances, it is generally believed that there is a resultant diminished circulating blood volume and decreased peripheral blood flow. In the presence of dilated and more permeable capillaries, there is progressive blood stasis and subsequent loss of plasma into the tissue spaces. Thus the oxygen supply to the tissues is greatly curtailed.* This course of events is progressive unless interrupted. One means of interrupting this sequence is to ad-

minister sufficient fluid to restore adequate circulating volume and improve the rate of blood flow. Furthermore, it is imperative that the vicious circle of progressively diminishing blood volume and blood flow and tissue anoxia should be interrupted as early as possible before severe and irreversible damage to the tissues occurs.

Blood transfusion has been the most acceptable measure in shock therapy. In profound shock, however, urgency in the administration of fluid is vital. The delay involved in securing blood and in the necessary laboratory tests of typing for compatibility and the like diminishes the value of blood transfusion, for in this time interval the state of shock may become irreversible and fatal. Even when a bank blood is available there is an unavoidable delay in performing laboratory tests.

The authors state that in a previous publication they had demonstrated that serum is an effective agent in combating shock resulting from hemorrhage. They review the case histories of 47 patients suffering from a variety of conditions who received human serum transfusions. Those patients suffering with shock from hemorrhage and other causes, hypoproteinemia or burns, were definitely benefited by serum transfusions, and in a number of instances a dramatic recovery was observed. The authors discuss the preparation of serum and bring out that the supply of serum is limited only by the supply of blood and when it is prepared it can be preserved for a long time. Serum transfusions may be given without preliminary laboratory typing and compatibility tests. No reactions were observed or need be anticipated if serum is properly prepared. Serum is preferred to plasma because it does not contain sodium citrate and because fibrin precipitates do not occur. The authors stress the point that serum is a valuable adjunct to any hospital or military transfusion service.

PAUL MERRELL, M.D.

Clegg, J. W., and Dible, J. H.: The Preparation and Use of Human Serum for Blood Transfusion in Shock. *Lancet*, 1940, 239: 294.

The use of stored blood is limited by its rather rapid deterioration and the number of unpleasant reactions that have occurred from it. To obviate these the separation of plasma from stored blood and its use as an alternative to whole blood have been advocated. This procedure effects a big economy in the blood bank. The resulting plasma-saline-citrate mixture has, however, disadvantages of its own. They are:

First, the fibrinogen fraction is unstable and tends to precipitate more and more on standing. In consequence the plasma solution comes to contain particulate matter, which makes the use of a straining filter essential. This prevents the plasma mixture from being given through a simple tube and funnel in an emergency when more complicated apparatus, which incorporates a filter in its system, is not available. Second, the separation of plasma from the cells involves a good deal of manipulation and, in addition, there is considerable chance of contamination.

The authors describe a method of preparing serum from stored blood with the advantages that the serum is sterile and of a satisfactorily high protein content, and can be given to patients irrespective of their blood-groups. The solution seems to remain free of particulate matter. The process utilizes blood which has been in the bank too long to be used for whole-blood transfusion, and thus effects a big economy.

In view of the widely held opinion that human serum is toxic when prepared by methods similar to the one used by these writers, skin tests were carried out on 9 batches of sera, a total of 54 tests being made. In none of these was there any reaction.

HERBERT F. THURSTON, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Peters, J. P.: The Structure of the Blood in Relation to Surgical Problems. *Ann. Surg.*, 1940, 112: 490.

The author notes that, as a general principle, it is reasonable to assume that reparative processes will be favored by measures that will preserve the integrity of both the volume and composition of the body fluids. All the secretions of the gastro-intestinal tract are approximately equal concentrations of chemical components. Fluids introduced into the stomach or intestine rapidly assume a composition which resembles, so far as salts are concerned, that of the native secretions of these viscera. When water enters the stomach or intestine, enough salt is poured into it to make it isotonic with the blood serum, and the composition of the salt mixture assumes the electrolyte pattern characteristic of that portion of the alimentary canal in which it happens to be. If a liter of water or saltless fluid, introduced into the intestine, is lost by vomiting or through a fistula, it will remove with it, approximately, the salt from one liter of serum or interstitial fluid. If vomiting is long continued, a final stage is reached in which dehydration, alkalosis, salt depletion, and reduction of osmotic pressure are all combined.

In severe diarrhea, bicarbonate is lost in the stools, while chloride is excreted in the urine. The end-result is a deficiency of sodium and bicarbonate with a relative excess of chloride in the depleted body fluids. The concentrations of sodium, bicarbonate, and chloride in the serum give valuable information concerning the severity of vomiting and diarrhea and the extent of the consequent depletion of salt and water. There is reason to believe that body cells swell when the salt concentration in the body fluids falls, just as red blood cells swell in hypotonic salt solution. Such swelling must seriously impair functional integrity. The most obvious clinical effects of salt depletion and dehydration are shock and failure of renal function, the latter manifesting itself in elevation of the blood non-protein nitrogen.

After his review of the physiological facts relative to fluid regulation, the author notes certain inescapable implications:

1. The alimentary canal is not relieved of work by the introduction of fluid, especially water.

2. Efforts should be directed to the prevention of distention rather than to the decompression of the stomach or intestines.

3. If only physiological isotonic solutions are introduced into the alimentary canal, dehydration and salt depletion will be minimized and the need for parenteral fluids will be proportionally diminished.

In conclusion, the author observes that distention and vomiting, either before or after operation, may often be allayed or checked by resting the gastro-intestinal tract as completely as possible. Complete rest is most easily achieved by withholding all food and fluids by mouth. If drainage by tube or lavage is instituted because this course or the courage of the physician fails, care should be taken that as little fluid as possible is introduced and that all food or fluid given by mouth or through the tube contains enough salt to make it isotonic with the blood serum. This allays secretory and motor activity of the gastro-intestinal tract and mitigates dehydration and salt depletion. If the sum of bicarbonate plus chloride in the serum is reduced, saline should be administered parenterally to restore the fluid and salt content of the body. Glucose may be added to the intravenous saline solution to provide some nutrition and to reduce the protein metabolism. It is unnecessary, however, under these circumstances, to administer large amounts of fluid parenterally. Only enough is required to establish an adequate volume of urine. The patient who is excreting from 1,000 to 1,500 c.cm. of urine daily is seldom a subject for anxiety. HERBERT F. THURSTON, M.D.

Ravdin, I. S.: Hypoproteinemia and Its Relation to Surgical Problems. *Ann. Surg.*, 1940, 112: 576.

The important factor in persistent vomiting, in diarrhea, following extensive burns, and in many other conditions is the protein of the body available to meet the body's demands, or the part that an adequate concentration of the plasma protein plays in keeping fluid in the blood vessels. Patients with a restriction of diet, a visceral injury, or with an excessive plasma loss have a reduction not only in the concentration of plasma protein but also in the total available plasma protein. There is no such thing as a critical level of plasma protein at which edema becomes manifest. As soon as the plasma protein falls below the normal concentration, fluid begins to leave the vessels, which results first in a latent and finally, when the accumulation of fluid in the tissues is great enough, in an evident edema. The administration of large amounts of neutral sodium salts will intensify the edema normally occurring at the same level as the plasma protein. In the presence of hypoproteinemia, attempts to restore a normal fluid and electrolyte balance, without at the same time increasing the colloid osmotic pressure by adding to the plasma protein, too frequently tend to result in adding to the extravascular fluid reservoirs.

During undernutrition, tissue protein is protected as long as carbohydrate and fat are available for energy requirements. However, tissue growth requires protein components, the amino-acids or larger aggregates, for building material.

As the plasma protein concentration falls from the normal 7.0 or 7.5 gm. per cent the osmotic pressure exerted by the plasma is reduced and fluids begin to leave the vessels and produce edema.

Hypoproteinemia intensifies the edema of trauma naturally occurring at the site of gastro-intestinal suture. Under normal conditions of fluid exchange the edema of trauma begins to disappear from forty-eight to seventy-two hours after operation, but in the presence of hypoproteinemia it continues to increase during this period, and results in a mechanical impediment to the gastric contents, and a decrease in intestinal motility.

The most rapid means of correcting protein deficiency is by giving repeated plasma transfusions. It is better to administer a small amount of plasma repeatedly, over a long period, than to inject a large amount during a very short period.

Delayed wound healing and disruption is associated with a profound disturbance in protein metabolism, the hypoproteinemia being only an easily measurable indicator of the extent to which the so-called "labile stores" of protein have already suffered. Vitamin C deficiency is also an important factor in wound disruption and delayed healing.

A liver with a high lipid and a low protein content is maximally susceptible to injury; a liver with a low fat and a high protein content is maximally protected from injury. Carbohydrate is advantageous if during its deposition in the liver fat is displaced and if, as a result of an adequate source of hepatic glycogen, hepatic protein is spared.

HOWARD A. MCKNIGHT, M.D.

Feriz, H.: Experiments with Tampons and Membranes Made of Collagen. *Surgery*, 1940, 8: 654.

The surgical importance of an absorbable and assimilable tampon material is evident. It would no longer be necessary to leave a foreign tissue in the body, which disturbs and delays the healing of the wound, in the form of an unabsorbable tampon. All the dangers associated with the removal of a tampon would be obviated, and the patient would be spared the pain associated with the manipulation of tampons. Moreover, the field of application of an absorbable, biologically non-irritating material could be widely extended, as compared with that of the tampon now in use.

The present development of resistant fiber from dissolved collagen creates the possibility for experimental investigation on absorbable tampons. The characteristics of a new, assimilable material that might be useful in surgery, and for tamponade and the isolation of tissues and organs were studied, and the result described. The material, brocatamp, consists of collagen and appears to be perfectly non-irritating to the surrounding tissues when implanted in rabbits. It is partly absorbed by the lytic activity of ferments and by phagocytosis, and partly organized either by direct infiltration of the connective-tissue cells or by the formation of granulation tissue.

SAMUEL KAHN, M.D.

Stchukarev, K. A.: The Pathogenesis of Postoperative Pulmonary Complications. *Vestnik khir.*, 1940, 59: 443.

Pulmonary complications are as frequent after local as after general anesthesia, although it must be admitted that they are more serious if ether is used in laparotomies. The rôle of aspiration has apparently been overemphasized. Some authors were inclined to consider exposure as an important causative factor in the development of pulmonary complications but these complications have not decreased since the introduction of artificially heated operating tables. Exposure may be considered only a minor contributing factor. The frequency of pulmonary complications in children and adolescents with normal hearts speaks against the importance of hypostatic factors, particularly stasis of the blood caused by heart failure. Apparently older writers were confusing a real hypostatic condition with an obstructive atelectasis. Hypostatic conditions may be considered as minor factors contributing to the development of postoperative pulmonary complications. As to pulmonary embolism, its occurrence is rare and the condition has no relation to postoperative pneumonia. The concept of microembolism, advanced by Wharton, Parson, and others does not find any support in clinical observations because pulmonary complications appear earlier and are not accompanied by characteristic signs of an infarct, such as hemorrhagic sputum and pleural pains. Pulmonary embolism should be sharply differentiated from postoperative bronchitis or bronchopneumonia which form the bulk of pulmonary complications. The author is not inclined to share the opinion of clinicians who believe that a preexisting infection is an important factor, because the frequency of such complications was found by him to be approximately equal in a group with and in another without postoperative pulmonary lesions.

The following factors must be considered as the most important in the pathogenesis of postoperative pulmonary complications: interference with the function of the diaphragm, hypoventilation of the lower portions of the lungs, constriction of the bronchi, disturbance of the tonus and motor function, impaired function of the ciliary epithelium, and the suppression of cough. Instead of speaking of obstruction of the bronchi and massive collapse of the lungs, the author prefers to speak of the draining function of the bronchi because a real obstruction does not occur in each instance. Retention and the multiplication of bacteria may take place without complete obstruction, as a result of suppressed cough and a disturbed function of the ciliary epithelium. It follows that atelectasis does not necessarily precede the development of pneumonia. Clinical and roentgenological examinations lend support to the author's concept of postoperative pulmonary lesions.

As to therapy, an active regimen, elevation of the head of the bed, limitation of circular dressings, frequent respiratory exercises, and inhalation of car-

bon dioxide are recommended. Morphine is indicated the first few days after the operation because it removes the inhibition of respiration caused by pain. The aspiration of bronchial mucus through a bronchoscope in cases of a threatening massive collapse of the lungs or pneumonia may be highly recommended. Quinine and camphorated oil are indicated in the treatment of postoperative pneumonia because they exert an inhibiting effect on pneumococci. JOSEPH K. NARAT, M.D.

Birgus, J.: The Prevention and Roentgen Therapy of Thromboses (Verhuetung der Thrombosen und deren Roentgenbehandlung). *Ceskoslov. Gynaek.*, 1939, 4: 12.

After a discussion of the cause of thrombosis, in which the collaboration of circulatory disturbances with changes in the blood and in the blood vessel wall is mentioned particularly, the author refers to the importance of prophylaxis, which should be instituted before operation or childbirth. The heart and circulation are carefully examined, an elastic bandage is applied to any existing varices, and a fall of blood pressure from spinal anesthesia or from vomiting in the course of operation is prevented so far as possible by circulatory measures. By means of flannel stockings cooling of the legs is made impossible. Immediately after the operation the legs of the patient are exercised passively by an attendant for five minutes, the bed is warmed with electric lights, and its foot elevated 25 cm. Both after operation and after delivery, leg and breathing exercises are begun on the first day. If in spite of these measures thrombosis occurs (in the author's material after 1.14 per cent of the operations and 0.76 per cent of the deliveries) the patients receive roentgen therapy. In 49 cases of thrombosis, 23 deep, 20 superficial, and 6 mixed, roentgen therapy was undertaken. Careful transportation to the roentgen apparatus is important. The extremity is divided into several fields and from 100 to 200 roentgens per field are given. In superficial processes one treatment is enough; in acute processes the treatment is begun with small doses. The duration of the process is shortened by roentgen treatment, the pain and swelling disappear more rapidly, and the pulse and temperature soon return to normal.

(R. K. FELKEL). RICHARD WARREN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Bellander, G.: The Treatment of Acute Frost Injuries (Zur Behandlung akuter Frostschaeden). *Svenska läk.-tidning.*, 1940, p. 487.

The time-honored treatment of acute frost injuries by massage with snow, for the purpose of restoring circulation, is beginning to meet opposition. In the Handbook of the Swedish Red Cross, this treatment is considered to be of little value, and simple massage is recommended instead. In the latest Field Service Manual of the Swedish Army the snow treatment is supplemented by massage with wool and, at regular intervals, by one-minute applications of warm water containing soap, with rubbing in the direction toward the heart.

The author's total rejection of the snow-massage treatment is based upon practical and theoretical objections. Cutaneous injuries frequently occur which are often more serious and dangerous than the original lesion. These dangers are not stressed sufficiently or at all in the popular presentations. Furthermore, the proponents of the method defend it on the basis of the necessity of thawing out the frozen part slowly. It appears irrational, however, to warm it by massage and, at the same time, to cool it with snow, rather than to omit the latter entirely and to avoid too rapid heat production by carefully controlled massage. Polar explorers have, apparently, entirely abandoned the snow treatment. A scientific participant in the expedition wintering on the Nordensköldfjeld on Spitzbergen told the author some four years ago that simple rubbing with the hands had served him well, and Admiral Byrd expressed himself to the same effect in his book "Alone at the South Pole." "The questionable method of rubbing with snow is not used in the Antarctic." At 50 degrees below zero, snow is as hard as stone; one might as well rub himself with sandpaper. A frozen foot of one of his companions was cured by placing it for from fifteen to twenty minutes against the skin of the abdomen of one of his comrades.

The author has not used snow for the past seven or eight years. In local freezings there are local changes in the cells in the form of colloid chemical disturbances plus spasms of the blood vessels, particularly of the arteries, from direct as well as indirect cold stimuli, which lead to ischemia. The local changes, when severe, may cause gangrene, which also, of course, may result from the ischemia. In all milder cases, the vascular spasm dominates the picture. Because of the good results obtained by contrast baths in vascular spasms of other conditions, such as intermittent claudication, the author has used them in acute frost injuries. In the first case so treated, a young man with a frozen toe that had been rubbed for one and one-half hours with snow by his comrades without success until the skin was desquamated, response was so surprisingly good, that circulation was completely restored within five minutes. In most of the following cases, the result was even more rapid.

A moderate range of temperature was always used, the warm water being somewhat below body temperature, the cold only about 15°C. Warmer water should be used for only very short periods. According to Moberg, in the treatment of chillblains, hot water should be applied for only ten seconds, because longer immersion relaxes the blood vessels. Otherwise, in hot and cold contrast baths, one minute in each is sufficient, with perhaps a slightly longer immersion in the hot bath than in the cold. The thawing should proceed slowly, otherwise the

restoration of the normal cellular chemistry is jeopardized.

The author recommends beginning with massage with the hands or dry wool and later thawing with cold water, the temperature of which is gradually increased to that of the room. He warns particularly against the use of hot water, since temperatures in the neighborhood of 50°C. may produce irreversible changes in the blood and blood vessels (hemolysis has been seen with even 50° and 52°). He, therefore, does not recommend the 45°C. water of the army regulations, and believes the contrast-bath temperatures should range between 15° and 35°C. The baths should be continued until the ischemia has entirely disappeared. The disadvantage of the method is that it requires warm water, and the question is what is easier and quicker, building a fire and warming water, or rubbing with snow? Resistant cases should be referred for surgical care as soon as possible. Amputation should be considered only when there is definite demarcation. Because of the reflex effects of the cold upon the sympathetic system, various operations on the vascular nerves may relieve the spasm and restore circulation. Among others up to now, x-ray treatments have been recommended for only chronic cases. The author believes they might also be used in recent cases, to initiate movement in the vessels, which is most important. (RICHTER). LEO M. ZIMMERMAN, M.D.

Girdlestone, G. R.: Plaster-of-Paris. *Lancet*, 1940, 239: 287.

Many war wounds are best treated with plaster-of-Paris. The use of this medium has peculiar virtues and dangers, and calls for special craftsmanship. It is an attractive medium. When the plaster is in good order, a creamy bandage or fabric makes a rigid shell in a few minutes, and passes progressively from almost perfect pliability to rigidity at a rate which conforms favorably with the purposes for which it is used.

The two main methods of use of plaster-of-Paris—the creamed fabric method and the bandage and water method—are described in detail.

SAMUEL KAHN, M.D.

Masciottra, E.: The Endarterial Injection of Mercurochrome in Infections of the Hands (El mercurocromo endoarterial en las infecciones de la mano). *Rev. méd.-quirúrg. de patol. femenina*, 1940, 16: 273.

In certain cases the author has given endarterial injections of mercurochrome in the treatment of infections of the hands, following the method advocated by Leriche and Dos Santos.

The endarterial method was first used in 1914 by Goyanes, who employed it in the treatment of tuberculous arthritis. In the same year Leriche and Hedaus successfully used the endarterial injection of anti-tetanic serum in the carotid artery. However, the first to use the procedure as a systematic method was Reynaldo Dos Santos, who had observed that there was no unfavorable reaction following arteriography. First he made simple injections of antiseptic drugs into the arteries in many infectious conditions and found they were beneficial. Later, at the suggestion of Joao Dos Santos, he also compressed the veins; by this means he could stop the immediate diffusion of the drug in the circulation and allow a longer period of contact with the tissues. The number of successful cases increased.

Leriche has employed this technique since 1929, and in 1938 he said that in his clinic of Strasbourg 2 or 3 endarterial injections were made every day. He has often seen the temperature fall to normal after only 1 injection of mercurochrome with definite arrest of the infection. After nine years of experience he continues to believe in the usefulness of this method and the value of studying it.

The indications for endarterial injection are manifold. They include all of the serious localized infections, with or without a tendency to spread in surface and depth. The injection has been employed especially in infections of the extremities of the limbs, superficial and deep phlegmons, tenosynovitis, cellulitis of the arm, and suppurative arthritis of the elbow. In serious infections, as for instance in 35 cases of arthritis with gangrene of the limbs, the previous injection of endarterial mercurochrome made possible a limited amputation. The gaseous gangrene was also favorably influenced by injecting anti-gangrenous serum into the arteries. It has also been employed in meningitis, encephalitis, and osteomyelitis of the maxilla. The location of the injection is indicated by the site of the infectious lesion. The point is to bring the drug in the most direct manner to the focus of the infection, according to the vascular anatomy of the region.

The location of the pressure cuff depends also on the part which has to be treated. For the head, the injection must be made in the carotid artery, in the axillary artery for the arm and elbow, and in the humeral artery for the forearm, wrist, and hand.

In the gynecological infections the injection goes into the abdominal aorta. As for the lower extremity, Dos Santos recommends the venous approach to reach the foot and the distal part of the leg and the femoral artery to treat the knee and the thigh.

The substances injected are several: anti-gangrenous and anti-tetanic sera and drugs, such as gentian violet and mercurochrome; recently sulfanilamide has been used with excellent results. The venous approach requires less concentration of the solution because of the larger amount of the injection. The endarterial injection acts by allowing the active substance to come into close contact with the bacteria and also by producing a favorable reaction of the cells of the diseased tissues. The author has treated about 10 cases of acute infections of the hand, such as cellulitis and tenosynovitis. In each case the treatment consisted of an injection of 5 c.cm. of mercurochrome in an aqueous solution of 1 per cent concentration. The injection was made in the humeral artery, and a pressure cuff was put

in the distal third of the arm, over the elbow. Immediately after the injection the patient felt a slight pain in the lesion, which disappeared almost at once and left only a sensation of pricking in the whole hand. At the same time the skin of the hand and forearm became stained a light red, showing that the dye had reached the capillaries. As soon as the pressure was released, the color disappeared and there was an important diminution of the pain in the lesion. The injections were repeated 2 or 3 times on subsequent days and no disagreeable reaction was ever observed. The effect of the injection was always very marked: the pain, the swelling, and the redness disappeared and the skin on the lesion became lightly pigmented, dry, and wrinkled. If the infection was of longer duration and there was abscess formation, this had to be drained according to the usual treatment of infections of the hand. However, the effect of the injection was always beneficial, it limited the spread of acute infection and the number of dressings required. The author believes that, if the injection is made in the early stages of an infection, it can often be terminated quickly. Some of the cases which are mentioned in the article show excellent results and give proof of the usefulness of this method.

HECTOR MARINO, M.D.

Smith, E. J. R.: The Use of Sulfur-Containing Compounds, Particularly Pentothal Sodium, in Conjunction with Sulfapyridine. *Brit. M. J.*, 1940, 2: 488.

It has been said that sulfapyridine should not be given to a patient if he has recently received pentothal sodium for the induction of anesthesia and, conversely, that a patient under treatment with sulfapyridine must not be given pentothal sodium. This prohibition may be inconvenient in both directions because subsequent to an operation during which pentothal has been employed it may become advisable to start sulfapyridine therapy for some unexpected infective complication. On the other hand, a patient with a large infected wound who is receiving sulfapyridine might well be given some pentothal for the first dressings or for the opening of abscesses. The reason for the prohibition has been the large amount of sulfur (12 per cent) present in pentothal sodium.

Thirty patients were given pentothal for anesthesia during operation. In 7 pentothal was administered for anesthesia at the time sulfapyridine was given intravenously. In 2 patients sulfapyridine was given intravenously within twenty-four hours after anesthesia. Eight patients received sulfapyridine by mouth at the time of operation; 9 patients received sulfapyridine by mouth within twenty-four hours after operation; and 4 patients received sulfapyridine by mouth within three days after operation. In all of these the only complication was nausea and vomiting. However, the incidence of this complication appeared to be lower in this series than in other series of patients given sulfapyridine alone. No cyanosis occurred in any case.

Magnesium sulfate and saline purgatives in general have been forbidden to patients receiving sulfapyridine or prontosil, as such a combination is said to cause cyanosis. If this is really true it is again unfortunate, because there are certain types of cases which require both drugs. The author refers particularly to those frequent cases of head injury in which there is both an actual or a potential infection of the brain or scalp, and the existence of a state of high intracranial pressure due to edema and congestion of the brain. Perhaps less important in war are those cases of patients with high pressure due to cerebral tumor and other conditions, who develop an infection, for example, a pneumonia, after operation. These patients require sulfapyridine for their infection and also magnesium sulfate by various routes for cerebral dehydration. Both at the National Hospital for Nervous Diseases, London, and at Horton, the author has dehydrated such patients by oral and rectal administration of magnesium sulfate during sulfapyridine medication without noting any untoward effects.

From these observations it appears that patients receiving sulfapyridine can safely be given pentothal and magnesium sulfate at the same time.

MANUEL E. LICHTENSTEIN, M.D.

Campbell, W. C., and Smith, H.: Sulfanilamide and Internal Fixation in the Treatment of Compound Fractures. *J. Bone & Joint Surg.*, 1940, 22: 959.

Fifty-four cases of compound fractures are reviewed by the authors in this study of the preventive or prophylactic action of sulfanilamide in compound fractures. They consider the study, however, only a preliminary report since a more comprehensive series of cases is now being accumulated. The fractures were divided into three groups: (1) fresh compound fractures; (2) old compound fractures with a previous infection; and (3) compound fractures with an active draining infection. Some form of metallic internal fixation was applied to thirty-one bones in 30 of the 54 patients.

Fresh compound fractures. A comparative analysis is made between the 35 cases in this group and a larger control group. The percentage of infection, 28 per cent in both groups, did not vary, but the evidence suggests that union occurs earlier in those infected cases that receive sulfanilamide (averaging two and seven-tenths months) than in the control cases without the drug (average of five months). This may mean that sulfanilamide is instrumental in arresting infection. According to their table, however, the incidence of malunion was higher in those cases treated with sulfanilamide (7 cases or 20 per cent) than in the control group (3 cases or 6 per cent). Three deaths and 2 cases of osteomyelitis occurred in the control group, none in the sulfanilamide-treated group.

Their routine for the administration of sulfanilamide is to place from 15 to 20 gm. of the crystals in the compound wound at the time of operation, the

wound then being closed without drainage. Twenty-four hours postoperatively the drug is started by mouth, from 15 to 20 gr. being given every four hours.

A further division of this first group was made in order to more accurately compare the incidence of infection to the degree of soft-tissue injury. There were no infections in the 8 cases of wounds classified as *mild*. Two of another group of 8 cases, termed *moderate* because of fairly extensive skin lacerations, showed infection. The 19 classified as *severe* revealed, in addition to extensive skin lacerations, considerable maceration of the tissues and foreign material in the wounds. The 8 infections that occurred among these 19 cases were equally divided between the cases in which internal fixation was employed and those in which no internal fixation was used.

Old compound fractures with previous infection. These 7 cases were thought to be significant from a standpoint of latent or potential infection, and although rather extensive operative procedures were performed on this group, no infections occurred. Eight grams of sulfanilamide or ten grams of neoprontosil were administered every day, from twenty-four to forty-eight hours before operation, up to from three to seven days after operation.

Compound fractures with active infection. The active infection and draining sinuses associated with the fractures in this group were often accompanied by mild elevation of the temperature and had existed for from three to nine months prior to operation. The corrective procedures carried out on these cases could be considered formidable operations. Internal fixation was employed in 10 cases.

The authors believe that the results with this type of fracture, those with active infection, were the most striking of the entire group in which chemotherapy was used, for although draining sinuses persisted in a number of cases for periods varying from several weeks to months, the wounds all ultimately healed and union of the bones occurred.

Prophylaxis in clean and potentially infected surgical cases. It was believed that the finding of a reliable prophylactic agent against postoperative infections would be particularly valuable in such potentially infected cases as a former virulent osteomyelitis. Sulfanilamide was used as such a prophylactic pre-operative measure in 51 cases. There was an incidence of 16.7 per cent of infections in this group as compared with an incidence of 10 per cent in an analogous control group of 100 cases. A sufficient number of infections occurred in the sulfanilamide-treated cases to create doubt of the prophylactic benefit of the drug in this group, but because of the limited number of cases studied, definite conclusions do not yet appear warranted.

Illustrations showing the types of internal fixation employed in selected cases of this series, together with statistical studies and comparisons arranged in tabular form, accompany the text.

HOMER PHEASANT, M.D.

Carroll, G., Kappel, L., and Lewis, B.: Sulfathiazole; Clinical Investigations. *J. Am. M. Ass.*, 1940, 115: 1350.

A study of the absorption, dosage, toxicity, and effectiveness of sulfathiazole was made in 200 controlled patients. The drug was administered orally to adults, in 0.5 gm. tablets, and in smaller portions to children and babies. The sodium salt was given intravenously, a 1 gm. ampule being dissolved in 100 c.cm. of sterile distilled water and injected slowly. The powder was used locally; it was sprinkled generously into infected wounds, or introduced by insufflation into cavities.

The peak of blood concentration occurs in about four hours after administration of the sulfathiazole and begins to decline after a period of six hours. For example, an adult patient suffering from a staphylococcic cortical abscess of the kidney was given 2 gm. of sulfathiazole at 9 a.m., and blood concentrations were reported as follows: at 11 a.m., 2.1 mgm. per 100 c.cm.; at 1 p.m., 5.2 mgm.; at 2 p.m., 5 mgm.; and at 3 p.m., 4.2 mgm. This is of clinical importance, and indicates that the doses of the drug should be spaced from four to six hours apart throughout the twenty-four hours in cases of serious involvement. After a single oral dose of 4 gm. of sulfathiazole, 1 gm. is recovered from the feces and urine in the first twenty-four hours, 2.5 gm. are recovered in forty-eight hours, and some traces are found as late as seven days after administration.

The usual prescribed dose for an adult is 2 0.5 gm. tablets orally every six hours. In the more severe cases a larger amount may be given with impunity. As much as 14 gm. daily have been given with no harmful effects; 1 woman was given intravenously 1 gm. of the sodium salt dissolved in 200 c.cm. of sterile distilled water, together with 6 gm. which were administered orally, in twenty-four hours; a blood concentration of 17 mgm. per 100 c.cm. was obtained and there were no ill effects.

Superficial lesions require smaller amounts than deep-seated lesions. The necessity of administering the drug in doses sufficiently large to bring about the therapeutic effect cannot be overemphasized. The medication, when tolerated, should be continued for a week or ten days after all clinical evidence of the disease has disappeared.

Children tolerate the drug well. Six grains (0.4 gm.) daily were given in the milk formula to a twenty-day-old baby suffering from staphylococcic septicemia; he recovered. Children of from two to five years of age have received 2 gm. daily. No ill effects have been noted in elderly patients or in those with poor kidney function. Caution should be used, however, in treating patients with known liver and kidney deficiency, since the drug is eliminated through these organs. Sulfathiazole is best tolerated with food in the stomach and has been given beneficially with diluted hydrochloric acid rather than with the alkalis so often given with sulfanilimide.

The toxicity of sulfathiazole is manifested variously by abdominal pain, nausea, vomiting, head-

ache, anorexia, melancholia, weakness, cutaneous rash, diarrhea, undue excitability, and nervousness. A peculiar conjunctivitis has also been noted. A few patients have presented red blood cells, albumin, and casts in the urine. Acetyl concretions have been noted in the bladder, ureters, and kidney pelvis of experimental animals, but no instance of concretions or anuria was encountered in the authors' clinical series.

The drug was found to be effective against the staphylococcus, pneumococcus, gonococcus, streptococcus fecalis, aerobacter aerogenes, and, to a less extent, the bacillus proteus and bacillus pyocyaneus. Surgical drainage must, of course, be instituted when indicated.

From the observations of others and from the authors' clinical experience, it is apparent that the sprinkling of sulfathiazole powder into an infected wound or on a lesion is also of definite value. Among the lesions so treated were old Ducrey's infections and herpes.

SAMUEL H. KLEIN, M.D.

ANESTHESIA

Vishnevskey, A. V.: Local Anesthesia and the Treatment of War Injuries. *Vestnik khir.*, 1940, 59: 179.

The author highly recommends local anesthesia not only in the treatment of minor injuries but also in the therapy of fractures. Shock may thus be prevented, and débridement of the wound, amputation, and other procedures are facilitated. However, the therapeutic value of procaine block in the presence of shock is more limited and therefore should be combined with a blood transfusion; both procedures counteract the depressive status of the nervous system and improve the hemodynamic conditions. Furthermore, a massive infiltration of the tissues with procaine prevents the rapid absorption of toxic products of decomposed tissues. Moreover, regression may be obtained in early stages of inflammatory processes, independent of etiological factors.

The author recommends the use of local anesthesia in the treatment of abdominal wounds as well as of wounds of the extremities. Such anesthesia, contrary to the opinion of many writers, can be easily obtained and is not time-consuming; it offers the advantages of combating shock and counteracting the spread of infection.

Injuries of the chest, especially an open pneumothorax, are also treated by the author by local anesthesia, although in deep wounds the anesthetic effect may not be perfect if sufficient attention is not paid by the anesthetist to the intercostal nerves. If the shock does not rapidly subside in grave chest injuries, the local anesthesia is supplemented by a cervical vagosympathetic block on the affected side.

JOSEPH K. NARAT, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Lofstrom, J. E., and Noer, R. J.: The Rôle of Intestinal Intubation in the Diagnosis and Localization of Intestinal Obstruction. *Radiology*, 1940, 35: 546.

Gastroduodenal siphonage by the utilization of the Miller-Abbott balloon-tipped tube has opened new avenues of approach to the diagnosis and treatment of intestinal obstruction. Such a tube can be introduced into the distended bowel and decompression be effected as the tube progresses along the gut to the point of obstruction. The balloon near the tip of the tube facilitates its passage.

In the study of intestinal obstruction, frequent roentgenoscopic and roentgenographic observations must be made to follow the progress of the tube through the bowel and to determine the resulting degree of decompression. When it is found that the tube has ceased to progress and that gaseous and fluid accumulations have been removed, localization studies are made by injection of opaque medium to the site of obstruction. If complete obstruction is present the medium can be readily withdrawn. This method permits the accurate determination of the exact type and extent of the obstruction. It is well to remember that the intubated bowel is less active than normal and that it may require several hours for the medium to pass only a few feet in the ileum.

When no evidence of obstruction or pathology is detected, the tube may be clamped and serial studies may be carried out by means of the oral administration of barium. The tube may be used to advantage in any segment from the duodenum to the terminal ileum.

A number of cases are reported in which the accurate diagnosis of the site and etiology of the obstruction was made pre-operatively. In one instance a carcinoma of the duodenum was found; in another, gall-stone obstruction; in others, chronic ileitis and obstruction due to postoperative adhesions.

Figure 1 reveals an area of narrowing in the terminal ileum found in a case of early postoperative obstruction presumably due to adhesions. Decompression by intubation completely relieved the symptoms and no further surgical intervention was necessary. HAROLD C. OCHSNER, M.D.

Golden, R., Leigh, O. C., and Swenson, P. C.: Roentgen-Ray Examination with the Miller-Abbott Tube. *Radiology*, 1940, 35: 521.

After a brief consideration of deflation of the gastro-intestinal tract, with special reference to the Miller-Abbott tube, the authors state that the purpose of this communication is to discuss the part played by the roentgen methods of examination in this procedure. Fluoroscopic control may aid in the passing of the tube into the duodenum. After the tube has entered the duodenum and the process of deflation has begun, the roentgen-ray examination becomes of prime importance to determine the program of the tube and the efficacy of deflation,

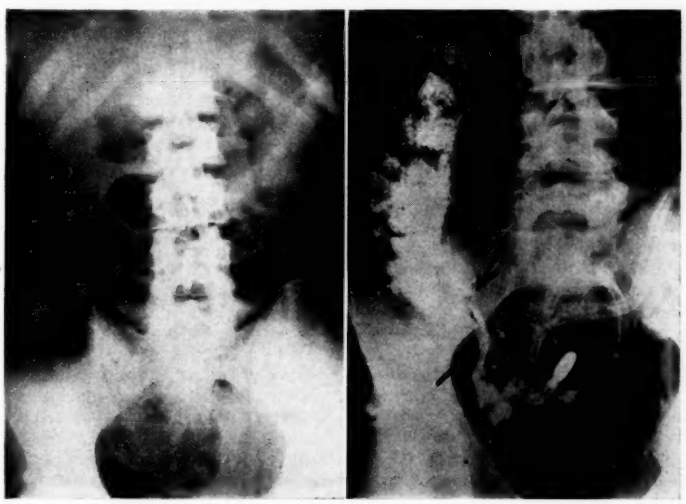


Fig. 1. Early postoperative obstruction, presumably due to adhesions. a, left, reveals distention; b, right, reveals the area of narrowing in the terminal ileum.

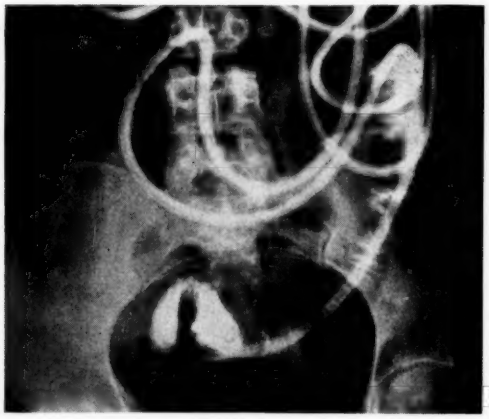


Fig. 1. Mechanical ileus due to late postoperative adhesions. After deflation and arrest of tube, barium injection disclosed a short kink, without the aid of pressure apparatus. The mucosal folds in the kink are normal.

and to record the findings if barium sulfate suspension is injected through the tube.

The details of technique and findings in various types of lesions are described and illustrated and several case reports are included to call attention to the value of the information which may be obtained. Consideration is given to the conclusions which may be drawn from the progress of the tube. As deflation progresses in paralytic ileus the tube advances slowly, much more slowly than in mechanical ileus. If there be questionable obstruction, the injection of barium will usually clear the doubt. The progress of deflation is indicated by diminution in the width of the distended loops and in a diminution in the number of gas distended loops. Deflation of the small intestine does not remove gas from the large intestine. If the tube tip passes to the cecum, mechanical obstruction of the small intestine is ruled out, showing that the ileus is paralytic in type.

Injection of barium-sulfate suspension through the tube may give information not obtainable otherwise. In the authors' experience no deleterious effect has ever been observed following it in diseases of the small intestine. Usually only a small amount of suspension is necessary to give the desired information. Injections should be made on the fluoroscopic table, preferably with a rapid switch-over spot film device to record the observations. With it the exact location of the tube-tip, whether in the small or large intestines, may be determined and constrictions may be localized. Frequently, conclusions can be drawn relative to the nature of the lesion by noting the variation of the mucosal pattern. When an adhesion causes the obstruction it usually produces a narrow kink measuring from 1 to 1.5 cm. in length, in which the mucosal folds appear normal. Strangulation, by producing congestion and edema of the wall, causes flattening, widening, or even obliteration of the mucosal folds. Inflammation involving the wall of the intestine from an adjacent abscess or other focus causes partial obliteration or coarsening of the mucosal folds in the narrowed area. Chronic sclerosing enetritis (regional ileitis) may cause mechanical ileus and produce a narrowing of shorter or longer segments of intestine. Malignant neoplasm invades and destroys the mucous membrane, and hence distorts or obliterates the mucosal folds. An annular growth is usually relatively short, from 3 to 6 cm. Although the mucous membrane has been destroyed, the inner surface may be irregular. Intussusception produces a long, narrow barium shadow. When the opaque material gets beyond the narrowing, it outlines the sheath into which the narrowed portion has invaginated, and the appearance will be the same as in intussusception.

ADOLPH HARTUNG, M.D.

Kirklin, B. R., and Weber, H. M.: Roentgenological Diagnosis of Diseases of the Small Intestine. *Am. J. Digest. Dis.*, 1940, 7: 475.

The standardized technique of examination for diseases of the small intestine which is used at the Mayo Clinic is as follows:

The patient appears for examination in the morning after fasting over night. If there is no fluoroscopic evidence of obstruction he is given 8 oz. of a suspension of equal parts by volume of barium sulfate and water. The usual inspection is made of the stomach and duodenum and the examiner attempts to force as much as possible of the suspension through the pylorus. The patient is then examined at ten to fifteen minute intervals until the stomach is practically empty. At this period he is instructed to eat breakfast of the kind to which he is accustomed in order to stimulate forward movement of the suspension. Study of the lower loops of the ileum is best effected by the retrograde method.

Disease of the small bowel is manifested by deformity of the lumen, alteration of its caliber, stiffening of affected segments, signs of obstruction, and changes in internal relief. The mucosal pattern may be effaced or deformed.

Diverticula are of common occurrence in the duodenum, especially in the region of the ampulla of Vater. Diverticula of the jejunum, which are uncommon, are likely to be large and multiple. Meckel's diverticula are relatively common but a definite roentgenological diagnosis is rarely established.

The principal roentgenological manifestations of new growths are localized deformity of the lumen, palpable tumor corresponding to the deformity, obliteration of mucosal markings at the site of the neoplasm, and signs of obstruction. Benign neoplasms are exceedingly rare, often single, and when multiple, not numerous. They are usually small, pedunculated, and not obstructive.

Although primary carcinoma is extremely rare in the duodenum, this condition is less unusual in other parts of the small bowel. Scirrhous carcinoma usually

encircles the bowel. Ulceration is only superficial, the shadow defect is smooth and concentric, a corresponding mass is evident, and obstruction is noted. Soft mucoid carcinoma is the most common malignant neoplasm of the small bowel. It is usually associated with ulceration and frequently only a crateriform or deeply pitted base is present. This remnant of the tumor may not be palpable and signs of obstruction are usually absent. If a considerable portion of the tumor remains, the diagnosis will be fairly obvious, but if the carcinoma has been destroyed to its base, difficulty may be experienced in making a differential diagnosis from tuberculous or non-specific enteritis. The most important point in the differential diagnosis is the fact that carcinoma is frequently limited to a short segment of bowel whereas enteritis usually affects relatively long segments. Sarcomas constitute a substantial percentage of malignant new growths of the bowel. The authors have found leiomyosarcoma to be the most common type; their roentgenological appearance is similar to that of simple intramural myoma.

The differential diagnosis of tuberculous enteritis and enteritis of indeterminate origin is usually difficult and often impossible. Both diseases present somewhat similar pathological changes and either may be restricted to the small bowel. In typical instances of tuberculous enteritis the lumen is roughly and irregularly corrugated. In chronic non-tuberculous enteritis the contour of the lumen is smooth and the narrowing is uniform. The final diagnosis, however, depends upon the demonstration of tuberculous foci elsewhere.

In certain nutritional deficiency states, alterations in the roentgenological appearance of the small bowel may be observed. These changes are so nearly alike that reliable differential criteria have not yet been established. The progress of barium through the bowel is delayed, peristalsis is sluggish, the intestinal contents divide the sub-divide irregularly, and the mucosal relief may be subdued or exaggerated. Eccentric distribution of the barium is striking and there may be dense accumulations in some of the intestinal loops and diffuse dispersion in other segments of the bowel. The intensity of all these signs is in direct ratio to the intensity of the clinical findings.

Involvement of the small bowel by diseases of adjacent structures is relatively common and it is often difficult to distinguish extrinsic from intrinsic lesions. HAROLD C. OCHSNER, M.D.

Case, J. T.: Roentgenology of Pancreatic Disease. Caldwell Lecture, 1939. *Am. J. Roentgenol.*, 1940, 44: 485.

In this article the author summarizes much of our present knowledge of pancreatic disease with special reference to the diagnostic and therapeutic possibilities which roentgen rays offer in connection with it. He believes that clinical methods are far from adequate to point out the correct diagnosis in many instances and that the aid to be derived from careful roentgen study deserves general interest. In order to show in what way the roentgenological method may contribute in arousing, confirming, or denying the suspicion of pancreatic lesions the symptoms associated with various lesions are discussed and the findings which may be anticipated are described and illustrated.

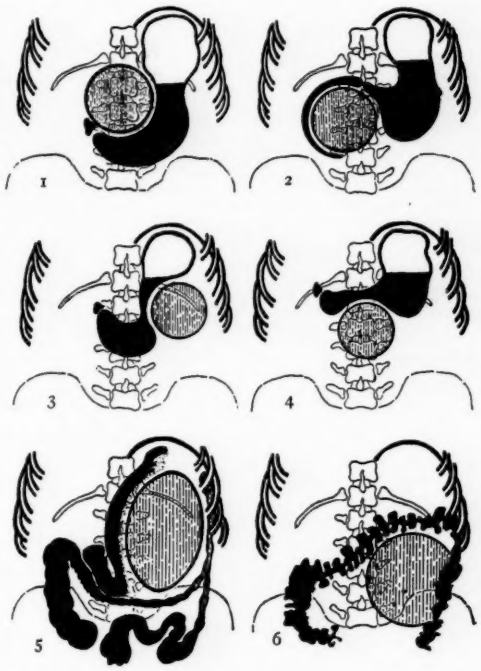


Fig. 1. Drawings from Porta and Roversi illustrating various roentgenological aspects of pancreatic cyst: 1, gastrohepatic type; 2, cyst of head of pancreas; 3, cyst of tail of pancreas; 4, cyst of body of pancreas; 5, gastrocolic type; 6, mesocolic type.

Direct roentgenological depiction of the pancreas is not possible except with the aid of artificial pneumoperitoneum, and this method seems justified only in exceptional cases. Practically the only pancreatic lesions amenable to direct and positive roentgenological demonstration are pancreatic lithiasis and gas abscess. Nearly always indirect findings associated with findings obtained from the adjacent parts of the alimentary canal serve for diagnostic information. Anatomical considerations are discussed insofar as they may be of value as a basis for roentgen study and interpretation.

The various lesions which are given detailed consideration include pancreatic cysts, gas abscess, carcinoma, lithiasis, and acute and chronic pancreatitis. Cysts usually owe their recognition to the displacement, pressure, and filling defects they cause on

Fig. 2.

Fig. 2. Carcinoma of head of pancreas. Duodenal spread. Irregular contour of duodenal shadow.

Fig. 3.

Fig. 4.

Figs. 3 and 4. Calculi in both head and tail of pancreas.

the barium-filled stomach, duodenum, or colon. Such defects are usually smooth in outline and vary with the location of the part of the pancreas involved. Excellent concepts of what may be expected are illustrated by drawings, sketches, and roentgenograms. Attention is called to possible sources of error, and means of differential diagnosis.

Gas abscesses present an accumulation of gas in the midepigastric region above a fluid level, demonstrable in the erect position or with the patient lying on the side. Examinations with an opaque meal serve to distinguish them from gastro-intestinal contents or diverticula which they may resemble.

Solid tumors of the pancreas may show compressions and obstructions in the neighboring organs or displace them if sufficiently large. If small there may be few or no roentgen signs associated with them, or functional disturbances of a non-specific character in the duodenum only may be present. In some cases extragastric tumor formation may be demonstrated by palpation during the fluoroscopic examination when pressure on the barium-filled stomach causes a filling defect to appear. The mucosal pattern in such instances is not disturbed and peristalsis is not interfered with, which factors tend to differentiate the lesion from an intragastric one. Carcinomas may invade the stomach or duodenum in which case they may cause irregularities of contour, alteration of the mucosal pattern, and functional disturbances of the stomach or duodenum which may make it difficult or impossible to determine the exact origin of the lesion. When the tumor is in the head of the pancreas it may produce widening of the duodenal normal curve. Compression or invasion of the duodenum may cause obstruction with appearances typical of that condition. Various special techniques are described which offer much help in arriving at accurate diagnosis in some cases, and the value of lateral films is stressed.

Pancreatic calculi appear in the roentgenogram as solitary or multiple round or irregular dense shadows lying near the upper lumbar vertebræ. When multiple their location usually suggests their origin, but frequently special procedures and diagnostic skill are required to differentiate them from densities of other origin.

In connection with acute pancreatitis, numerous authors are cited as having noted, either on plain films or in examinations made with a few swallows of contrast material, findings which they considered of definite diagnostic value when the condition was suspected. These are discussed and attention is called to the fact that such examinations may reveal associated pathology, which may have an etiological relationship. Chronic pancreatitis also offers possibilities for diagnostic aid from the roentgen examination especially if the lesion has progressed to the extent of causing firm enlargements of the organ. A possible connection between duodenal diverticula or dilatation of the ampulla of Vater and chronic pancreatitis has been suggested and these lesions are readily demonstrable roentgenologically.

Possible pancreatic lesions in connection with ulcers of the duodenum or stomach penetrating into that organ are discussed briefly and criteria for establishing this probability are mentioned. Diagnostic information relative to disease of the pancreas to be derived from cholangiography and cholecystography are also given consideration.

As regards radiation therapy of pancreatic disease, the results to date have not been very satisfactory. Chronic pancreatitis has responded fairly well in the author's experience, but the results in neoplastic lesions have been only palliative. Reports from others are also cited to show that irradiation may prolong the life and alleviate the symptoms of patients with carcinoma of the pancreas, but it offers little hope of cure. ADOLPH HARTUNG, M.D.

Rendich, R. A., and Harrington, L. A.: Roentgen Findings in Caisson Disease of Bone, with Case Reports. *Radiology*, 1940, 35: 439.

Kahlstrom, Burton, and Phemister reported in the February, 1939, issue of SURGERY, GYNECOLOGY AND OBSTETRICS 4 cases of caisson disease of bone, to which they added 12 cases collected from the literature. They also described in detail the pathology of the disease, especially in the case in which autopsy was performed.

The authors now communicate 4 new cases in order to emphasize the rarity of this condition and its characteristic roentgen features. The primary lesion is an accumulation of nitrogen gas in the bone due to the too rapid removal of the individual from the decompression chamber. The roentgen changes produced resemble those seen after long interruption of the blood supply, as in slipped epiphysis, fracture, or dislocation. They may be placed in three categories: (1) aseptic necrosis involving the bones of the hips, shoulders, or knees; (2) medullary calcification in the diaphyseal ends of the long bones; and (3) hypertrophic arthritis. Numerous roentgenograms are reproduced to illustrate these changes. It is stated that the necrosis in the head of the long bones and the resultant osteoarthritis may constitute the only manifestation of the disease in the individual cases.

T. LEUCUTIA, M.D.

Forestier, J., and Robert, P.: X-Ray Diagnosis in Chronic Arthritis. *Proc. Roy. Soc. Med.*, Lond., 1940, 33: 707.

The authors classify the roentgenological findings of inflammatory arthritis into three periods of development, namely, the periods of onset, of development, and of stabilization and repair. At the onset of the disease the roentgenographic findings may be negative for a period of several weeks or two or three months. The essential sign is bony decalcification which appears locally and is especially marked at the epiphyses of the affected joints. During the development of the disease the decalcification increases and sometimes both epiphyses are uniformly decalcified. The joint space may disappear not only as a result of narrowing of the space but because of increased density due to inflammatory deposits in the joint space, with loss of transparency. Postural changes are frequently detected in the period of stabilization and, if the damage has been extensive, final deformity will remain. Partial irregular recalcification takes place, the contours of the epiphyseal bone will appear more clear but there will be no reconstruction of the joint space or recovery of movement lost through fibrous or bony ankylosis.

The radiologic findings of arthrosis or osteoarthritis are also outlined in some detail. The first change in this condition is local hypercalcification, which appears in the suprachondral area of the epiphysis, especially at points of weight-bearing. It tends gradually to develop over the whole surface and also toward the center of the epiphysis. Usually this change appears in both bones forming the joint. Hypercalcification is associated with progressive loss of trabeculation, which brings about softening of the bone substance. Later there are plastic changes in the contours of the epiphysis, flattening of the bony ends, and marginal lipping. Less commonly, local decalcification may occur in the course of arthrosis. This is true especially in the hip joint. In osteoarthritis the trabeculæ disappear from the cortex and are replaced by the uniform dense shadow of opaque bone. At a distance from the joint space the trabeculæ of the bone become thicker and rougher. The osteosclerotic bone can undergo plastic changes in its contour. Osteophytes and syndesmophytes may appear at the articular margins. The gradual thinning of the joint space in arthrosis is one of the essential characteristics of the disease. Postural changes may occur through pressure defects in the articular surfaces, which become softer.

HAROLD C. OCHSNER, M.D.

Van Nuys, R. G.: Normal Bone Angles and the Roentgen Report. *Radiology*, 1940, 49: 206.

The author believes that the roentgenologist in reporting fractures can make his reports more definite and helpful by stating variations from the normal in angles and centimeters. He has studied numerous films of wrists, elbows, shoulders, hips, knees, ankles, and feet, and has recorded the measurements of angles in normal and pathological cases. He points out some of the important variations. Two rulers which he has found useful in obtaining the desired angles are illustrated. The indication of the amount of deviation from the normal in the manner outlined can materially assist the surgeon in the reduction of fractures and inform him if such reductions have been accomplished satisfactorily.

ADOLPH HARTUNG, M.D.

Fig. 1. On the right is an old Pott's fracture before attempted reduction, with 20-degree valgus. On the left is the reduction, with 12-degree valgus.

Heinrich, A., and Staedter, G.: The Changes in the Human Spine during Life as Revealed by the Roentgen Rays (Die Aenderungen im Roentgenbild der menschlichen Wirbelsaeule waehrend des Lebens). *Ztschr. f. Alterforsch.*, 1940, 2: 134.

The normal changes of the spine due to age as shown by anteroposterior and lateral roentgenograms are studied in detail. Schematic sketches are used to show how in the lateral view the long oval, ventral, and dorsally depressed form is gradually converted into a right-angled form, in which during middle life a slight upper and a lower depression occurs. Between the third and sixth year the connection between the body of the vertebra and this curve becomes visible; in old age osteoporosis usually sets in and a decrease in height of one or a group of vertebræ occurs, especially of those in the thoracic portion of the spine, and in particular of those in the anterior portion (wedge-shape). More rarely a gradually increasing depression occurs in the upper and lower contour as it occurs pathologically in Cushing's disease and in multiple myeloma, so that confusion with these diseases is possible. Also, Hand-Schueller-Christian disease, osteomalacia, avitaminosis, and starvation osteopathy give similar pictures. According to Spiller, spondylitic changes are seen in myeloma but not in the atrophy of old age. From the eleventh to the thirteenth year one often sees a three-cornered center of ossification of the cartilaginous marginal edge in the upper and lower corner of the ventral contour; this marginal edge usually melts or fuses with the body of the vertebra not later than the twenty-fourth year of life. In the dorsal spine of youth one frequently sees in the middle, running through the vertebra horizontally, an apparent crack (Hahn's canal) through which veins course. The dorsal part of this canal is not visible after the second year of life, but the ventral part, especially in the fifth and seventh dorsal and in the first and second lumbar vertebræ frequently remains visible until the fourteenth year. The relationship between the intervertebral space and the height of the vertebra in the newborn is 1:1; after a year it is only 1:2 in the lumbar region and 1:3 in the region of the dorsal spine; at the age of eight the relationship is 1:3; in middle life 1:4; and in advanced age 1:5 or 1:6 in the dorsal region. The decrease in height of the intervertebral discs takes place particularly in the anterior portion because as a result of the normal kyphosis there is a greater pressure here and because posteriorly the spinal joints prevent a crowding together. A decrease in water content (which occurs analogously in the lens and in cartilage as age increases) of the intervertebral discs probably is responsible for their decrease in thickness. In the osteoporosis of the spine due to age associated with fish-spine formation, according to Junghanns, the water content of the intervertebral discs is considerably increased so that this change cannot be considered as a simple change due to old age. According to the opinion of the author, this is a premature aging of the bodies of the vertebræ, whereas the intervertebral discs have the age of the remainder of the body and take on water only secondarily. In the roentgenogram of the newborn taken in the sagittal plane the bodies of the vertebræ show only two transverse shadows, the upper of which is much more concave upward than the lower one; in the lumbar vertebræ one can recognize the membrana tectoria as a faint shadow, with the concavity downward. From the second year this upper shadow is also recognizable on the dorsal vertebræ, and whereas the membrana tectoria becomes only slightly flattened with age, the basal membrane becomes horizontal in old age and even becomes concave downward. The upper edge of the vertebral arch is concave upward; this concavity becomes greater with age, the most pronounced point often being covered with the spinous process. The attachments of the arch to the body of the vertebræ in the infant are at the upper lateral part of the vertebral body shadow and gradually move downward with age until they are at the middle of the vertebral body. The transverse processes in the dorsal part are visible in the newborn, but the rib processes of the lumbar spine produce a recognizable shadow only from the second year. The spinous processes of the lumbar spine are visible in the picture from the third or fourth year of life, in the dorsal spine from the fifth to seventh years of life. After the eighth year of life all the spinous processes become visible in the sagittal view.

Among the pathological changes of the spine dependent upon old age, the authors consider only those diseases which occur during a definite period of life. They discuss juvenile kyphoses, advanced-age kyphosis, and spondylitis deformans. The juvenile or adolescent kyphosis (Scheuerman's disease) occurs, according to Schmorl, because the intervertebral disc develops gaps or lacunæ in its hyaline marginal plate, which may be congenital or may develop because of some trauma, and which may protrude into the body of the vertebra. This disc prolapse causes the formation of a reactive cartilaginous or bony plate which is visible in the roentgenogram. In the lateral view these cartilaginous nodules may appear as a partly rounded and partly irregular defect, especially in the anterior part of the lower edge of the body of the vertebra. During the florid stage and during the healed stage which occurs after one or two years, one frequently sees a definite wedge-shaped shadow in the dorsal spine and especially in the neutral portion of the body of the vertebra. Whereas the apex of juvenile kyphosis lies in the lower dorsal spine, that due to kyphosis of old age and osteoporosis lies a little higher. The senile kyphosis is pathological if there is a bony union ventrally between the bodies of the vertebræ as a result of the disappearance of the intervertebral discs. One must differentiate the kyphoses which are not due to old age and those in which as a result of pathological osteoporosis fusion takes place. In regard to spondylitis deformans, which according to Junghanns begins as early as the

third year of life in 20 per cent of people, the authors call attention to the fact that spondylitic spurs do not arise from the edge of the developed body of the vertebra but always a little above the previous marginal ridge. The rapidity of growth of these spurs is variable. "Spangenbildung" always reveals a cranial and a caudal spur in advance, but the rate of growth of a single spur is very irregular. Illustrations show a "spangenbildung" in process from one and one-half to five years.

(Arthur Hintze). Leo A. Juhnke, M.D.

Halley, E. P., and Melnick, P. J.: Pre-Operative Irradiation in Carcinoma of the Breast; A Histological Study. *Radiology*, 1940, 35: 430.

Our knowledge of the histological mechanisms by which radiation destroys tumors is at present incomplete. Melnick and Bachem in 1937 studied the time factor in the irradiation of malignant tumors and elaborated certain principles of radiation effect on experimental rat tumors when protracted and fractional methods were used. The authors now extend these investigations to the human being.

A series of 21 cases of cancer of the breast which were irradiated with tumor doses ranging from 1,200 to 4,500 roentgens over periods varying from eleven to forty-nine days were subjected to mastectomy and the specimens examined histologically for radiation reaction criteria. The interval between the completion of the irradiation and the operation was from one to forty-five days. In those cases which received the larger doses, the irradiation was carried to a full second-degree skin reaction with erythema, vesiculation, and desquamation. The surgery was performed as soon as cleanliness was feasible.

The histological findings in these cases correlate closely with those found following the irradiation of rat tumors. In the early stages, radiosensitive tumor cells undergo primary necrosis. Beginning about three weeks after more extensive irradiation, fully developed pleomorphism of the remaining tumor cells can be seen, which eventually leads to abnormal mutation-like forms (giant cells). Four or five weeks after the end of irradiation only small clumps of débris, containing groups of calcified giant-cell nuclei, are found, some of these being phagocytosed by foreign-body giant cells. The normal tissues, including lymph and blood vessels, are intact and no fibrosis is observed. The startling thing, however, is the fact that at this stage the surviving carcinoma cells resume their activity with great vigor. Newly proliferating carcinoma simplex makes its appearance with progressive invasion along the lymph channels.

Therefore, since obliteration of the lymph and blood vessels does not occur and since 90 per cent of the irradiated breast cancers resume their growth early, the authors recommend that amputation be performed within from two to four weeks (instead of the usually recommended two to three months) after the end of irradiation to a full second-degree desquamative skin reaction. T. Leucutia, M.D.

Garland, L. H.: The Effect of Iodized Oil on the Meninges of the Spinal Cord and Brain. *Radiology*, 1940, 35: 467.

From his own observations and a review of the pertinent literature, Garland believes very definitely that fresh lipiodol may be used with complete safety as a contrast medium in the spinal subarachnoid spaces. He believes that no other contrast medium is at the same time as accurate and as harmless. He makes the point that it should be used only when the additional procedure of roentgenography is justified, and that its use should always have been preceded by thorough clinical, laboratory, and roentgenological study. He, like many another, has found encapsulated globules of the oil in the meninges months and years after its introduction into the cisterna magna or lumbar sac, but he has never seen changes in the underlying nervous tissue attributable to the presence of the lipiodol. He points out that one main objection to its use, other than the occasional mild pain and fever which may follow temporarily in some patients, is that it remains a permanent roentgenological defect, and that its effect on the patient, his physician, compensation boards, and juries may be one to cause apprehension, however unjustified. John Martin, M.D.

RADIUM

Mueller, R.: Five Years' Experience with the Radium Treatment of Hemangioma. Results and Appraisal (Fuenf Jahre Radiumbehandlung von Haemangiomen. Ergebnisse und Kritik). *Muenchen. med. Wchnschr.*, 1940, 1: 538.

The article analyzes the experiences with 144 patients, 115 of whom were females and 29 males. The latest treatment was begun at the end of 1938 so that a long enough interval for careful observation was afforded.

The hemagiomas were treated with radium, which in most cases was applied in direct contact or at distances not exceeding ½ cm. In general, small amounts (20 mgm. of radium element) were used. The tubes which were applied with adhesive tape remained in place from three to four hours, the others from four to six hours. Between treatments intervals of from six to eight weeks and often from one-fourth to one-half year elapsed so that the average duration of treatment was nine and one-tenth months. In this manner it was possible to avoid, even in infants, the radiation damage which occurs in the period when growth and development are most rapid. After one treatment the hemangiomas could be observed to cease growing and gradually to regress. They disappeared without leaving behind disfiguring scars or other skin changes.

Radium treatment is indicated not only in the inoperable hemangiomas; it is the treatment of choice in the operable ones also because, on the one hand, it avoids mutilation and the danger of infection and, on the other, it leads to the best cosmetic result. The earliest treatment possible is important

to the cosmetic result. Numerous children were treated at the age of four weeks. Radium needles were used in occasional cases: when an especially circumscribed and effective result was to be obtained; in adults, whose blood capillaries are very much less sensitive to radiation, and in cases in which the application tends to be technically difficult. More recently and particularly in the oral cavity "close" radiation with the Van der Plaat plate has been performed; this will be reported later. Because of its safety and its brilliant results radiation treatment of hemangiomas is the treatment of choice. (DIETRICH BLOS). RICHARD WARREN, M.D.

Melville, A. G. G.: The Double Radium-Mold Treatment of Carcinoma of the Floor of the Mouth and Lower Alveolus. *Brit. J. Radiol.*, 1940, 13: 337.

The "double mold" radium method which is practiced at the Christie Hospital and the Holt Radium Institute of Manchester is believed to be ideal for the treatment of carcinoma of the anterior part of the floor of the mouth and alveolus. It consists essentially in sandwiching the tumor between a layer of radium in the mouth and a second parallel layer under the chin. Occasionally a radon implant is added to the area of weaker dosage to make up the difference.

The intra-oral mold is made of such thickness as to permit a distance of 5 mm. between the radium and mucous membrane. The submental mold which is carried on a nidrose collar allows a distance of 2 cm. or more between the outer radium and the skin. Once the molds are placed in position, roentgenograms are taken to check whether they are parallel and whether they include the whole tumor in the field of irradiation or not. The strength and arrangement of the tubes are such that a dose of 9,000 roentgens is delivered at the mucous membrane, 6,000 roentgens on the skin, and a minimum of 5,000 roentgens to the irradiated tissue. This means that, on an average, the molds are applied for ten hours a day for ten days.

It has been found that lesions exceeding 3 cm. in diameter rarely lend themselves to permanent cure; therefore this diameter may be accepted as the maximum for a treatable tumor. The thickness of the floor of the mouth, that is, the distance from the surface of the intra-oral mucosa to the surface of the submental skin varies between 3 and 4 cm. If 3.5 cm. is taken as an average, the following table gives the milligram hours necessary with 0.5 mm. of platinum filtration to obtain the aforedescribed dosage in roentgens:

Inner Mold 10 cm.^{2} @ 0.5 cm.....1760
Outer Mold 18.8 cm.^{2} (oval 6x4 cm.) @ 2.0 cm.6250
Inner Mold 15 cm.^{2} @ 0.5 cm.....2090
Outer Mold 24.7 cm.^{2} (oval 7x4.5 cm.) @ 2.0 cm.....6940
Inner Mold 20 cm.^{2} @ 0.5 cm.....2720
Outer Mold 31.4 cm.^{2} (oval 8x5 cm.) @ 2.0 cm..7600
Inner Mold 25 cm.^{2} @ 0.5 cm.....3170
Outer Mold 37.6 cm.^{2} (oval 8x6 cm.) @ 2.0 cm.....8260

For radium filtered by 1.0 mm. of platinum, multiply these figures by 1.1.

For radium filtered by 1.5 mm. of platinum, multiply these figures by 1.22.

A total of 96 cases was treated by the double-mold method from 1933 to 1938, inclusive. A statistical compilation of the final results shows that 46 per cent of the treated patients were alive and free from disease three years after treatment, and that 61 per cent of the primary lesions healed and remained healed for three years, although the development of cervical metastases in some prejudiced the final prognosis.

When metastases to the regional lymph nodes occur, a radical block dissection is performed without the addition of pre-operative or postoperative radiation. T. LEUCUTIA, M.D.

MISCELLANEOUS

Stone, R. S., Lawrence, J. H., and Aebersold, P. C.: A Preliminary Report on the Use of Fast Neutrons in the Treatment of Malignant Disease. *Radiology*, 1940, 35: 322.

Neutrons are electrically neutral particles of matter, each having approximately the same weight as a proton (the nucleus of the hydrogen atom). For the treatments here reported, they were produced by bombarding a target of beryllium with deuterons (nuclei of heavy hydrogen or deuterium) with energies of 8,000,000 volts. The deuterons were given their energies in the Lawrence cyclotron. The cyclotron repeatedly applies electrical propulsions to deuterons moving in circular paths in a magnetic field. When the fullest possible energy has been given to the deuterons they are drawn out of the accelerating chamber by a deflecting potential to strike a beryllium target. This bombardment sets free great numbers of neutrons having energies up to 12,000,000 volts. These radiate from the target in much the same way as x-rays spread out from a target bombarded with electrons. In addition to the neutrons, gamma rays are produced when the deuterons are stopped.

Collimation of these fast neutrons into a useful beam is accomplished through delimitation by an outward tapering channel through a wall of paraffin (or water) more than 50 cm. thick. The accompanying gamma radiation is reduced greatly by lining the channel with 3 cm. of lead and by covering the outside of the hydrogenous shield with more than 2.5 cm. of lead. Gamma rays from the target are suppressed by a lead filter 3 cm. thick in the channel.

The personnel operating the apparatus is further protected by tanks of water, 3 feet thick, surrounding the whole apparatus and the treatment room. The patients are observed by mirrors.

For practical purposes a convenient arbitrary unit for measurement of the intensity of a neutron beam is that quantity of neutrons which discharges the Victoreen condenser type roentgen meter to the same extent as would 1 roentgen of x-rays. This unit has come to be called a neutron unit and is abbreviated as "n." The multiplying factor for obtaining the ionization in tissue caused by neutrons relative to that caused by x-rays is probably not more than 2.5.

The dose of neutrons to be used on patients was arrived at by a study of the comparative effects of x-rays and neutrons on biological indicators. The relative sensitivities of the different biological indicators are not the same.

The first patient treated was a man who had a carcinoma of the upper alveolar ridge invading the maxilla. A dose of 180 n, given to a field 10 by 10 cm. over the left side of his face, produced much the same effect as would have been expected from 900 roentgens of 200 kv. x-rays. Later 24 patients were treated, all having been given single large doses. Fractionated treatments were not possible. In general it was found that doses of from 180 to 200 n administered to fields 10 by 10 cm. in size to the side of the face and neck always produced a moderate erythema which appeared between the seventh and eleventh days, deepened until about the twenty-first day, gradually changed from erythema with dry scales to pigmentation, and left very little residual change after a few months. Epilation was always produced, but varied in the time of its appearance, the average being twenty-eight days. Doses up to 270 n did not produce blistering but did produce deeper erythemas and more marked scaling. Subsequent treatments were given only after the first reaction had completely subsided, or persisted only as pigmentation. In these cases from 125 to 270 n were given.

The cutaneous reaction was similar to that noted after the first irradiation but the height of the reaction was reached in about eighteen days. Eight patients were followed up for more than a year. The late effects have been similar to those seen after x-ray treatments of similar biological amounts.

A minimum threshold pigmentation will probably be produced by about 90 n as measured in air. This reaction is similar to that described by Quimby to occur after irradiation with 525 roentgens (measured in air) of 200 kv. x-rays.

In every case there was some decrease in the size of both the primary lesions and the metastases. Six extensive ulcerating necrotic lesions of the lateral pharyngeal wall responded very little, but the cervical metastases from these decreased markedly. A carcinoma of the soft palate disappeared for a few months but recurred. Two bronchogenic carcinomas responded quite poorly. As with x-rays, the nasopharyngeal lesions responded very well. The most promising results were those obtained on the neck metastases. Those cases which had had previous x-ray therapy responded least of all, as was to be expected. Two skin carcinomas were far advanced and had had previous x-ray treatments. Eight patients have lived more than one year, but all still have their tumors. HAROLD C. OCHSNER, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Isaacs, B. L., Jung, F. T., and Ivy, A. C.: Clinical Studies of Vitamin A Deficiency; Biophotometer and Adaptometer (Hecht) Studies on Normal Adults and on Persons in Whom an Attempt Was Made to Produce Vitamin A Deficiency. *Arch. Ophth.*, 1940, 24: 698.

Two distinct efforts were made to produce Vitamin A deficiency in normal young adults.

In the experiment in which liquid petrolatum was used to impair Vitamin A absorption, the biophotometer was used to test dark adaptation. The instrument did not prove to be as reliable as had been anticipated. With this instrument it was impossible to detect any correlation between the dietary Vitamin A of normal subjects, their biophotometer performance, and possibly presumptive clinical signs of Hypovitaminosis A. When efforts were made to produce Vitamin A deficiency with large doses of liquid petrolatum in these subjects, no statistically reliable evidence of deficiency was detected by photometric measurements, nor were there ever any signs or symptoms of Vitamin A deficiency. Supplements of oil concentrates which provided 200,000 units of Vitamin A and 2,700 units of Vitamin D daily produced no apparent change in any of the subjects.

The second experiment was more accurately controlled through the use of a satisfactory photometer and by rigid supervision of the diet.

It was observed that the 3 subjects who lived on a deficient diet for forty-three, forty-nine, and forty-nine days, respectively, failed to show more than a suggestion that their stores of Vitamin A were being depleted as determined by dark adaptation levels. The subjective symptoms reported by one subject (G) suggested a possible temporary hypovitaminosis beginning on the fourteenth day. Another subject (S) reported suggestive symptoms on the sixteenth to forty-second days, although his dark threshold was never greatly elevated. The third subject never gave any evidence of a deficiency.

There are reports in the literature from 7 groups of observers who have tried to produce Vitamin A deficiency in human subjects through limitation of the dietary intake of Vitamin A. Twenty-two different persons have been maintained on diets containing from 50 to 300 units of Vitamin A daily for periods ranging from twenty-five days to six months. The subjects have been tested for signs of impaired dark adaptation by the same or by a similar apparatus under similar experimental conditions. It is significant that each group has reported a difference in the time at which signs of possible deficiency appeared. One group found no evidence other than histological changes in the skin after six months on the deficient diet. The authors' results seem to indicate a failure to produce a definite evidence of deficiency after forty-nine days on a daily diet containing 74 units of Vitamin A. The subjects must either have had a large store of Vitamin A or were very unsusceptible, or it takes a long time to manifest definite evidence of deficiency. Another group referred to the production of recognizable changes in dark adaptation after twenty-four hours on a diet, with more pronounced signs after eight days.

Restoration of Vitamin A has been attempted by the administration of oil concentrates in doses varying from a single dose of 8,500 units to 300,000 units daily for several months. The results with this form of therapy have been even more variable than have been the signs of the depletion.

In view of the fact that several observers have reported a probable Vitamin A deficiency among the general population, amounting in some areas to as high as 52 per cent, it seems advisable to consider the meaning of this. The possibilities which occur to us are, (1) that the average American diet may be deficient in Vitamin A or its precursors; (2) that the standard of Vitamin A intake on which subjects are judged to be deficient is questionable, and (3) that the procedures being used for measurement are recording something other than Vitamin A deficiency. We incline toward a combination of the latter two possibilities.

A large subjective factor is involved in the determinations obtained in all types of visual tests. It is our opinion that the subjective factors should be recognized and an attempt be made to control them when measurements of dark adaptation levels are made; also, that significance should not be attached to minor fluctuations in dark adaptation in terms of Vitamin A deficiency unless statistical methods are used to test the reliability and validity of differences.

PAUL STARR, M.D.

Paolino, W.: Hemostasis (Sull'emostasi). *Minerva med.*, 1940, 31: 193.

After having discussed the various theories of blood coagulation the author analyzes the methods which have been used to control hemorrhage due to hemorrhagic diathesis and allied conditions. He admits that a rational treatment of these conditions is not possible at the present stage of our knowledge. Therefore, the following substances have been used in part empirically:

1. In hemophilia good results have been obtained by small repeated bleedings or by the introduction into the organism of small quantities of whole blood. Also foreign proteins have been used.

2. Snake venom has given good results in local treatment and in hemophilia.

3. Many investigators believe that some hemorrhagic diatheses are due to a hypovitaminosis and

have with some success, attempted the use of vitamins, such as Vitamin C or K, or some polyvalent vitamins, adding a certain amount of calcium and lactose.

4. Hormones such as ovarian extracts have also been used.

5. Calcium, because of its rôle in the formation of thrombin, has been adopted in the form of calcium chloride in 10 per cent solution, which is given intravenously.

6. The administration of various tissue extracts has been attempted, such as extracts from the spinal cord and muscle from pigeons.

The author himself has used a preparation, widely known in some European countries and introduced by Braconnet in 1924, called "sangostop," whose active principles are the pectins of vegetable origin. Chemically, pectins are carbohydrates of high molecular weight which are probably formed by the polymerization of galacturonic acid.

Paolino reports good and quick results by the injection of 10 c.cm. of a 3 per cent solution per day in chronic cases and from 20 to 30 c.cm. in acute cases of hemorrhage due to tubercular lesions, varicose veins of the tracheal mucus, and gastric or duodenal ulcer. Either intravenous or intramuscular injections can be used without any difference in the time of coagulation. In all patients Paolino regularly observed nearly complete arrest of bleeding after the administration of the remedy and immediate resumption of hemorrhage when the treatment was discontinued. The effect of sangostop on the bleeding time begins after twenty minutes, reaches its peak one hour later, and lasts about twenty-four hours. The influence on the time of coagulation was less remarkable than on the bleeding time. The number of platelets was remarkably increased after one injection, from 330,000 to 480,000, and was even greater after a prolonged treatment, up to 580,000 after one week of daily injections. Sangostop causes also an increase in the amount of fibrinogen, from 0.271 gr. to 0.478 gr. after one injection, and to 0.536 gr. after one week of daily injections.

The constant shortening of the bleeding time was not always correlated with an acceleration of the coagulation time and an increase in the number of platelets. The efficacy of sangostop could be remarkably improved by a complementary injection of calcium chloride.

The hemostatic action of this remedy seems to be due, according to the author, both to a direct action on the permeability of the blood capillaries and to a general stimulation of the production of platelets and fibrinogen.

NELDA CASSUTO.

Ilyin, V. C. and Vavzikovskaya, E. I.: The Pathogenesis of Traumatic Shock. The Oxidative Coefficient of the Urine and Blood in Experimental Traumatic Shock. *Vestnik khir.*, 1940, 59: 143.

Numerous authors have described a disturbance of the oxidative processes in traumatic shock. Acidosis and changes in the basal metabolism serve as indirect proofs of such disturbance. The present authors employed more direct methods of evaluating the oxidative processes in their study on the pathogenesis of experimental traumatic shock. The oxidative coefficient of the urine and blood was determined in rabbits after the production of shock by hammering the muscles of the thighs without injury to the bones.

The authors found that the oxidative coefficient of the urine rises markedly after mechanical trauma has been applied to the muscles, especially the first few hours after the injury. A parallelism could be established between the gravity of the shock and the rise of the coefficient.

The oxidative coefficient of the blood and the residual nitrogen do not undergo marked changes after mechanical trauma.

The amount of blood sugar rises sharply after mechanical trauma of the muscles; the amount of lactic acid in the blood also increases. The authors were not able to establish in each instance a parallelism between the fall of the blood pressure after mechanical trauma of the muscles, and a rise of the oxidative coefficient of the urine, as well as the development of other phenomena of shock. The grave condition of the animal after serious trauma cannot be attributed to hematomas in the muscles.

A rise of the oxidative coefficient of the urine follows shock produced by repeated, interrupted stimulation of the sciatic nerves with the electric current. This observation supports the reflex theory of shock.

A marked disturbance of the oxidative processes in the organism represents one of the most important symptoms of experimental traumatic shock.

JOSEPH K. NARAT, M.D.

Shimkin, M. B., and Grady, H. G.: Carcinogenic Potency of Stilbestrol and Estrone in Strain C_3H Mice. *J. Nat. Cancer Inst.*, 1940, 1: 119.

The influence of various estrogens on the formation of breast tumors in mice appears to be proportional to their estrogenic activity. To elicit breast tumors in 20 per cent of male mice of a highly inbred strain, in which practically 100 per cent of the females developed spontaneous breast carcinoma, 1.2 mgm. of stilbestrol or estrone were given over a six-month period, or over about one-fourth of the life span of the animals. The weekly doses of 0.05 mgm. each were from 500 to 1,000 times the estrogenic dose for mice, and the total doses were equivalent to at least 12,000 mouse units per animal, or 400,000 units per kilogram. The mice tolerated well the large doses of the two estrogens, and no marked lesions, except breast tumors in both male and female mice and tumors of the genital tract in females, were encountered. No lesions of the lymphoid apparatus suggestive of lymphoid tumors were noted in the mice injected with estrone or stilbestrol. Enlargement of the spleen and subcutaneous lymph nodes in these mice was not of neoplastic origin.

Splenic enlargement occurred in mice bearing breast tumors and was due to varying degrees of myeloid metaplasia, which is a frequent finding in tumor-bearing mice. The enlargement of the lymph nodes appeared to be due solely to the proliferation of macrophages evoked by the injections of oily solutions.

The investigation shows that stilbestrol possesses the property, common to all estrogens, of eliciting mammary carcinoma in mice of susceptible strains and that subcutaneously injected stilbestrol in sesame oil is slightly less potent in eliciting breast tumors in the strain of mice used by the authors than the same amount of estrone in peanut oil.

JOSEPH K. NARAT, M.D.

Lorenz, E., and Stewart, H. L.: Intestinal Carcinoma and Other Lesions in Mice Following the Oral Administration of 1, 2, 5, 6-Dibenzanthracene and 20-Methylcholanthrene. *J. Nat. Cancer Inst.*, 1940, 1: 17.

The effect of feeding carcinogenic hydrocarbons to animals has been studied during recent years by a number of investigators. Although papillomas and carcinomas of the stomach and neoplasms in the region of the mouth have been reported in a few instances, in most cases no tumors of the gastro-intestinal tract were found even after feeding of the carcinogen for as long as ten months. In these experiments the hydrocarbon usually was dissolved in a fatty or oily substance which was mixed with the food, dropped into the back of the throat with a glass dropper, or fed through a stomach tube.

The authors' investigations were undertaken for the following reasons:

1. To work out a simple method of oral administration of known quantities of carcinogenic hydrocarbons.

2. To obtain data by absorption spectrum analysis as to the fate of these hydrocarbons in the animal body.

3. To study the pathological changes produced by long-continued oral administration of these substances.

Two strains of mice were given orally, aqueous olive-oil emulsions containing either 1,2,5,6-dibenzanthracene or 20-methylcholanthrene, instead of drinking water, for various periods of time up to thirteeen months. The fate of the dibenzanthracene in the body tissue, the body fluids, and excreta was traced by absorption spectrum analysis. It was found in unchanged form in the gastro-intestinal tract to the level of the ileocecal junction. No dibenzanthracene was found in the large intestine or the feces, and none was detected in other body tissues or fluids within the limit of sensitivity to the spectrographic procedure. There is presumptive evidence, however, that absorption of the hydrocarbon from the gastro-intestinal tract occurs, which explains tumor induction in the lung.

The principal lesions observed were adenocarcinoma of the small intestine, multiple primary tumors of the lung, atrophy of the hematopoietic and genital tissues, and anasarca.

JOSEPH K. NARAT, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Christie, R., and Keogh, E. V.: Physiological and Serological Characteristics of Staphylococci of Human Origin. *J. Path. & Bacteriol.*, 1940, 51: 189.

A study of 220 strains of human staphylococci in an effort to relate a simple test with pathogenicity reveals that no one single procedure is infallible. The most accurate simple test is coagulose production in which all known pathogenic strains are proved to be coagulose positive. Mannitol fermentation gave false positives; however, positive fermentation within forty-eight hours was usually indicative of "coagulose positiveness." The authors concluded that staphylococci producing local infections are different from the usual type found in the nose and mouth and are more complex antigenically.

STANLEY ROBBINS, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Castex, M. R., and López García, A.: The Study of a Method of Determining Urobilin by Fluorescence With Zeiss' Nephelometer Connected with Pulfrich's Photometer (Estudio de un método de dosaje de la urobilina por fluorescencia, utilizando el nefelómetro de Zeiss aplicado al fotómetro de Pulfrich). *Rev. Soc. argent. de biol.*, 1940, 16: 301.

The authors show that the fluorescence of solutions can be measured accurately by the use of Zeiss' nephelometer attached to Pulfrich's photometer. The apparatus is illustrated and described.

Fluorescent solutions of urobilin in Royer's buffer medium placed in the nephelometer show a beautiful green, more or less intense, fluorescence, which may be measured in comparison with the light reflected by a clear glass which is placed before the other window of the nephelometer. At first sight the values do not seem to be comparable because the total light emitted by a fluorescent solution is made up of three factors: (1) the light really resulting from fluorescence; (2) the light diffracted from particles in suspension in the liquid (turbidity); and (3) the reflected or fluorescent light emitted by the recipient. The method of eliminating the two latter factors and arriving at the absolute fluorescence is described, and graphs are given which show that the absolute fluorescence of solutions of urobilin or trypaflavin is exactly proportional to their concentration.

It is impossible to eliminate the factors of turbidity and light emitted by the recipient with the naked eye; they are much greater than the absolute fluorescence. Therefore, these techniques exaggerate the value of fluorescent luminosity, which can be determined accurately only with the nephelometer-fluorescimeter.

AUDREY G. MORGAN, M.D.

Castex, M. R., and López García, A.: A Comparative Study of the Estimation of Urobilin as Urobilinogen by the Method of Watson and Heilmeyer and by Fluorescence, with Zeiss' Nephelometer and Pulfrich's Photometer (Estudio comparativo del dosaje de la urobilina como urobilinógeno, por el método de Watson y Heilmeyer y por fluorescencia, utilizando el nefelómetro de Zeiss y el fotómetro de Pulfrich). *Rev. Soc. argent. de biol.*, 1940, 16: 311.

In a previous article the authors have described a method of using Zeiss' nephelometer attached to Pulfrich's photometer for determining the fluorescence emitted by urobilin dissolved in Royer's buffer medium. In this article they discuss the comparative results obtained by using this method and the method of determining urobilin in the form of urobilinogen by the method of Watson and Heilmeyer. Graphs and tables showing the details of the results are given.

They conclude from these results that the maximum normal urobilinuria for twenty-four hours is 0.80 mgm. and that the determination of urobilin by the fluorescent method is more accurate than the determination of urobilinogen by the method of Watson and Heilmeyer and the use of Ehrlich's reagent. AUDREY G. MORGAN, M.D.

EXPERIMENTAL SURGERY

Spink, W. W., and Hansen, A. E.: Sulfathiazole. *J. Am. M. Ass.*, 1940, 115: 840.

In the course of studies on 128 subjects suffering from a variety of infections, Spink and Hansen compared sulfathiazole with sulfanilamide and sulfapyridine as regards its pharmacology, toxicology, and therapeutic effectiveness. The question of toxicity is of considerable importance. Thus far, in their experience, the authors found that sulfathiazole appears to be no more toxic than either sulfanilamide or sulfapyridine. In fact, troublesome nausea and vomiting which not infrequently follow the administration of sulfapyridine are not so commonly encountered when sulfathiazole is used. The incidence of dermatitis, however, is greater following the use of sulfathiazole than after the use of either sulfanilamide or sulfapyridine.

As regards the therapeutic phase of the study, it appears that sulfathiazole has the same value as sulfapyridine in the treatment of pneumococcic pneumonia. Sulfapyridine seems to cause a more abrupt fall in temperature than sulfathiazole; however, there is some evidence that sulfapyridine may have a non-specific antipyretic effect. When sulfapyridine was given to febrile patients who had fever not due to an infectious agent, a prompt decrease in the temperature was noted, which in turn was followed by a rise when the drug was omitted. This was true especially in a case of lymphatic leucemia in which there was no evidence of an infection. Whether or not sulfathiazole is as valuable as sulfapyridine in the therapy of pneumococcic meningitis as well as the value of topical application of sulfathiazole for localized staphylococcic lesions may be determined only by further investigation.

There is no doubt, however, that sulfathiazole is more effective than sulfapyridine in the treatment of staphylococcic septicemia and appears to be the best therapeutic agent available for this infection at the present time. Sulfathiazole appears to be of especial value in the treatment of infections of the urinary tract due to the bacillus proteus, alpha hemolytic streptococcus, escherichia coli, and the staphylococcus. Its use may result in sterile cultures of urine when sulfanilamide therapy has been ineffective. J. M. MORA, M.D.

Rake, G., Van Dyke, H. B., and Corwin, W. C.: Pathological Changes Following Prolonged Administration of Sulfathiazole and Sulfapyridine. *Am. J. M. Sc.*, 1940, 200: 353.

Sulfathiazole, when given as 2 per cent of the diet, killed 77 per cent of the mice receiving it during a four-week period, and produced lesions chiefly in the spleen and genito-urinary tract. Sulfapyridine was not lethal, and produced fewer pathological changes.

In rats, sulfapyridine was twice as toxic as sulfathiazole, as shown both by the effect on the growth curve and by the lesions produced in the genito-urinary tract.

In monkeys which received a single daily dose, sulfapyridine was more toxic than sulfathiazole, as shown by the lesions in the genito-urinary tract and, to a lesser extent, by loss of weight and leucopenia. SAMUEL KAHN, M.D.

Cope, O., and Kapnick, I.: The Relation of Endocrine Function to Resistance and Immunity. The Changes in Complement and Response to Vaccina Following Alterations in Thyroid, Adrenal, and Pituitary Function in the Rabbit and Dog. *Endocrinology*, 1940, 27: 533.

The course of infection in patients suffering from certain endocrine disturbances is frequently more virulent than in normal individuals. The authors believe that this difference may be due to nonspecific physiological abnormalities which are secondary rather than primary to the endocrine dysfunction.

Quantitative studies were made of the titrations of complements in the blood serum of the rabbit and dog, and of the reaction in the rabbit to injection of vaccina, associated with experimental endocrine dysfunction.

A direct relation between thyroid function and complement concentration in the blood serum of rabbits was observed. The complement concentration decreased following thyroidectomy. Hyperthyroidism induced by thyroxine was associated with a rise in the complement concentration.

A similar decrease in complement concentration followed hypophysectomy in rabbits. Adrenalectomy was followed by no change in complement concentration in the rabbit and dog.

The response to vaccina virus was not altered in the rabbit by thyroidectomy or injections of thyroxine. A delayed response followed adrenalectomy and a diminished response followed hypophysectomy. EDWARD W. GIBBS, M.D.

Fine, J.: Plasma Transfusion in Experimental Intestinal Obstruction. *Ann. Surg.*, 1940, 112: 234.

Five dogs subjected to intestinal distention at a pressure of 20 cm. of water were given plasma intravenously and continuously, to replace part or all of the anticipated loss of plasma as determined from previous data already published. Effective maintenance of the control plasma volume occurred when the intravenous supply of plasma was known to be adequate.

Interruption of administration of plasma was followed by a drop in plasma volume sufficient to cause death. The survival time of these dogs was prolonged from an expected average of twenty and eight-tenths hours for dogs with distention not receiving plasma, to forty or more hours.

The intravenous injection of physiological saline solution, in an amount sufficient or more than sufficient to replace the fluid lost under the conditions of the author's experimental technique, confers no noticeable benefit.

Loss of plasma continues as long as distention continues in the obstructed small intestine of the dog. The extent of this loss, if uncompensated, is sufficient in itself to cause death, and is of primary importance in the pathological physiology of intestinal obstruction. CHARLES BARON, M.D.